2019

# Towards a Critical Understanding of Deepfakes: Developing a Teaching Module and More

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Pomona College

5 May 2019

Revised 17 May 2019

Submitted as part of the senior thesis for the degree of
Bachelor of Arts in Science, Technology, and Society

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# Acknowledgments

I would like to thank Professor Perini so much for her guidance and support this past year on this thesis. I would like to thank Professor Keeley for his mentorship through the years and for agreeing to read this thesis. Thank you to all the STS professors for teaching classes that I have really valued during my time at Pomona. Finally, thank you to all of my friends and family that have supported me this whole time.

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# Chapter 1: Introduction

On a couple of occasions, while teaching small classes of teenage students, I have shown my students a particular video depicting former U.S. President Barack Obama speaking. The reactions are inevitably strong. Usually, it's horror—sometimes, a pared-down version of existential dread. It has nothing to do with Obama himself, though, or even with what he's saying. It's because the video is not entirely a video of Obama himself. Instead, a small army of computer-edited Obamas lip-sync to pre-recorded audio in remarkably lifelike fashion.

The video is supplementary material to a paper published in 2017 by three computer scientists at the University of Washington entitled "Synthesizing Obama: Learning Lip Sync from Audio."[1] In the paper and the video, the researchers describe the method they developed using neural networks—complex frameworks for training computers to perform specified tasks—to manipulate videos of Obama to depict him realistically lip-syncing to match input audio tracks. The University of Washington researchers are not the only group working on automating video creation and recombination, though. Within the past couple years, researchers at the University of California, Berkeley have introduced a method for creating videos of a person dancing based on the detected movements of another, and members of online communities such as Reddit have introduced a method for altering videos by swapping one person's face for another's that can be performed on a typical personal computer.[2] These computer-generated and computer-altered videos are commonly known as *deepfakes*, as they tend to utilize a technique known as deep learning to train computers.

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[1] Suwajanakorn et al., *Synthesizing Obama*.
[2] Rothman, "In the Age of A.I."

My students are not the only people disturbed by the existence of deepfakes. Others nationwide, from lawmakers[3] to celebrities[4] to journalists,[5] have expressed concerns about the harms deepfakes may cause to democratic elections, national security, people's reputation, and people's autonomy over their words and actions as represented in videos and other media. Indeed, the term deepfakes itself comes from a Reddit community that used the technology to swap celebrities' faces onto the bodies of actresses in pornographic films, and it is likely that the term has stuck due to the discomfort and moral outrage that resulted.[6]

Where do we go from here? How can we build towards a critical understanding of not only deepfakes, but also photos, videos, and the role of many other media objects surrounding us that inform us about the world? I wanted to bring the field of Science, Technology, and Society (STS) to bear on this problem of our time, so I chose it as the topic of my senior thesis. This thesis contains four parts. In Chapter 2, wanting to take a historical approach, and noting the newness of deepfakes, I investigate a historical case study regarding a manipulated photo from a 1950 U.S. Senate election campaign. Examining hearings conducted by the Senate into the use of misleading media in the election, I investigate how the incident sparked a debate between different groups of people over the trustworthiness of photographs and their proper role in elections.

In Chapter 3, I move forward in time and discuss the nature of deepfakes, presenting a brief history focusing on the different communities—academic, hobbyist, and commercial—that have played a role in the development of different, but related, technologies that all fall under the umbrella term of deepfakes. Some of this history is incorporated into Chapter 4 of this thesis, in

[3] Breland, "Lawmakers Worry about Rise of Fake Video Technology."
[4] BuzzFeedVideo, *You Won't Believe What Obama Says*.
[5] Foer, "The Era of Fake Video Begins."
[6] Cole, "AI-Assisted Fake Porn Is Here and We're All Fucked."

which I present a teaching module I developed with the goals of guiding students to think critically about photos and videos and of raising awareness about deepfakes. Finally, I conclude this thesis in Chapter 5.

# Chapter 2: The Struggle over Trustworthy Photographs in a 1950 Election

In this section, I investigate a historical case study from a 1950 U.S. Senate election, in which one campaign was met with public censure for distributing a composite photograph—a single photograph formed from two distinct photographs arranged together and re-photographed. I chose this case study in particular because the campaign that created the photograph was subsequently investigated by the U.S. Senate in 1951, providing 600,000 words' worth of primary-source text from the hearing transcripts alone. These hearing transcripts provide insight into the perspectives and responses of various people involved in and affected by the creation of the composite photo. Focusing on the hearing transcripts as well as the final report of the Senate Committee on Rules and Administration, I investigate how the incident caused a struggle between different groups of people over the trustworthiness of photographs. I conclude by arguing how this turn of events from 1950 may help us develop a more nuanced and critical understanding of deepfakes, 70 years later.

## 2.1. Research Questions and Thesis

In conducting this historical case study, I hope to answer the following research questions. How did photographs shape the forms of life in the U.S. during the middle of the twentieth century? How did different people respond to the composite photograph, and how were these responses informed by the way photographs shaped life?

Two STS secondary sources will be particularly important to my analysis: Langdon Winner's theory of technologies and forms of life, and Lorraine Daston and Peter Galison's book *Objectivity*. I will introduce these sources fully in the body of my study as they become relevant.

I argue that photographs are understood by some to play a crucial role in American life around the year 1950 as *trustworthy* evidence in the activity of forming a belief about the truthfulness of a claim. The Senate committee conducting the investigation is concerned that the process of creating a composite incorporates choices that embed the artist's subjective interpretations in the composite photograph. This becomes a problem if objectivity is associated with truth—if subjectivity in photos undermines their truthfulness, then photographs are no longer trustworthy evidence. The committee responds by attempting to secure the objectivity and protect the trustworthiness of photos in political contexts by morally condemning the composite photo and by calling for new rules and laws.

## 2.2. Historical Background

In 1950, Democratic incumbent of 24 years Millard Tydings ran against Republican challenger John Marshall Butler for one of the Maryland's seats in the Senate.[7] Tydings lost the November election and presented complaints to the Senate a month later, accusing the Butler campaign of unfair campaign practices and violations of election laws.[8] In particular, he protested a composite photograph in a tabloid entitled "From the Record," which was created and distributed by the Butler campaign to 300,000 homes in Maryland days before the election.[9] The tabloid contained several misleading and false stories intended to attack Tydings's loyalty and patriotism. The composite depicts Tydings in close conversation with Earl Browder, former leader of the Communist Party of the United States of America. It was later shown to be constructed from two separate photos of the individuals, cut and arranged and re-photographed to

[7] "The Election Case of Millard Tydings v. John M. Butler of Maryland (1951)."
[8] "The Election Case."
[9] "The Election Case"; Ruth, "Tydings Asks Senate to Bar Butler from Seat," 26.

appear as if the composite were a photograph of the two in person. The composite is shown in Figure 4.1, and its two component photos are shown in Figure 4.2. In the tabloid, a caption below the picture reads,

> Communist leader Earl Browder, shown at left in this composite picture, was a star witness at the Tydings committee hearings, and was cajoled into saying Owen Lattimore and others accused of disloyalty were not Communists. Tydings (right) answered, "Oh, thank you, sir." Browder testified in the best interests of those accused, naturally.[10]

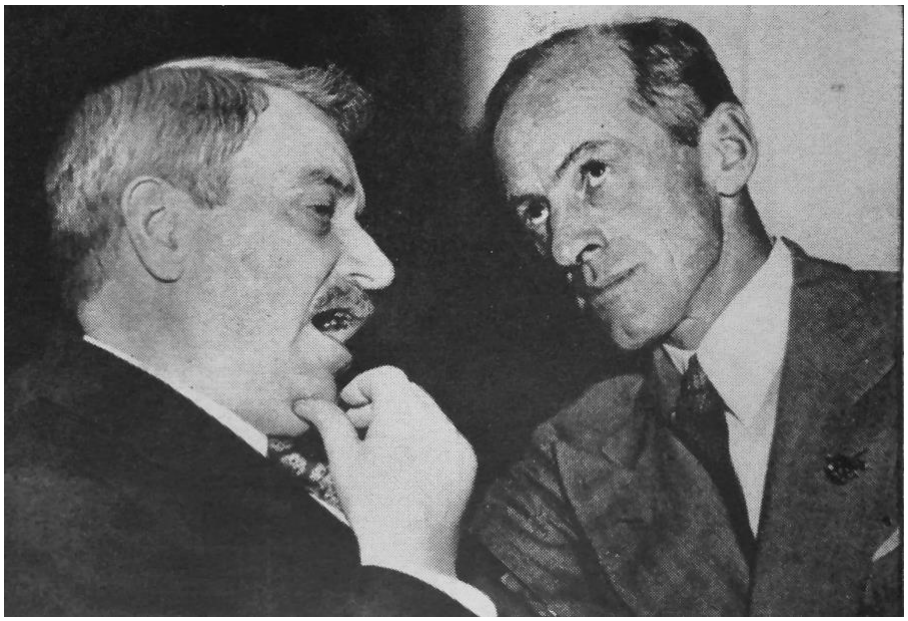

Figure 4.1: The composite photo of Tydings (right) and Browder (left) as it appeared in "From the Record."[11]

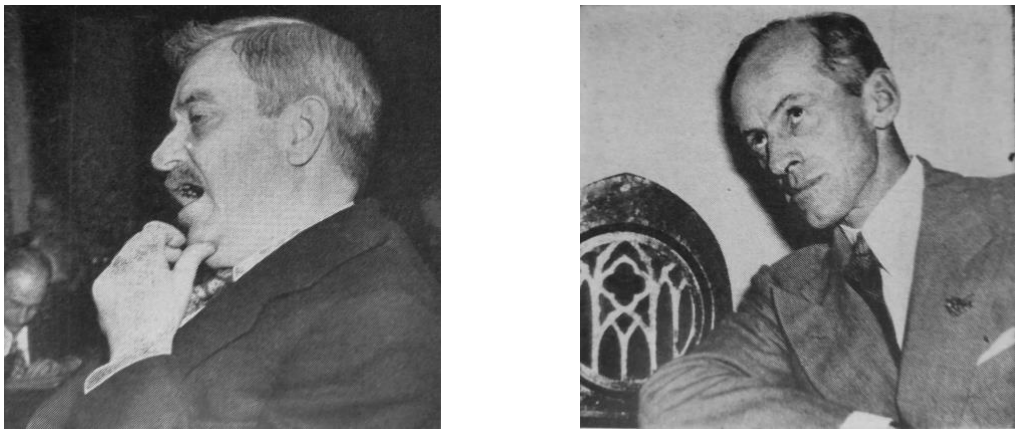

Figure 4.2: The original two component photos of Browder testifying in a Senate hearing in 1950 (left) and of Tydings listening to election results in 1938 (right).[12]

[10] U.S. Senate, Committee on Rules and Administration, *Maryland Senatorial Elections of 1950: Report*, 21.
[11] "Composite Trickery."
[12] "Composite Trickery."

This photo was significant in the context of other events that had occurred that same year. In the spring of 1950, Wisconsin Senator Joseph McCarthy gave a speech claiming that Communists had infiltrated the State Department. A Senate committee, chaired by then-Senator Tydings, was formed to investigate; committee members voted along partisan lines, with the Democratic majority condemning McCarthy's claims as "a fraud and a hoax," and the Republican minority claiming that the Democrats had whitewashed treasonable conspiracy.[13] The caption referred to a moment from those hearings and suggested that Tydings had failed to adequately question Browder during Browder's testimony. The photo illustrated that moment, depicting an arguably intimate—even conspiratorial—association between Tydings and Browder. At a time when the Korean War was in full swing and tensions with Communist governments were high, such an association with a Communist Party leader in the U.S. was politically dangerous.

In response to Tydings's complaints, the Senate formed a committee of four senators within the Subcommittee on Privileges and Elections of the Committee on Rules and Administration to investigate the Butler campaign.[14] The bipartisan committee consisted of Democratic senators Mike Monroney and Thomas Hennings, as well as Republican senators Robert Hendrickson and Margaret Chase Smith. It is worth noting that both Republican senators, unusually, were outspoken against McCarthyism. Smith is well-known for a 1950 speech she gave, in response to McCarthy's charges of Communists in the State Department, denouncing

[13] Fried, *Nightmare in Red*.
[14] U.S. Senate, Committee on Rules and Administration, Subcommittee on Privileges and Elections, *Maryland Senatorial Elections of 1950: Hearings*.

the spread of fear, ignorance, bigotry, and smear in the Senate; Hendrickson was one of six Republican senators who signed her "Declaration of Conscience."[15]

The committee held public hearings in 1951 from February through April investigating the Butler campaign for defamation, financial irregularities, and the involvement of outsiders.[16] Testimony revealed that the Butler campaign had received significant help from McCarthy's staff to mount a smear campaign against Tydings. Concerning the composite photograph specifically, testimony showed that its creation was a collaboration between members of the Butler campaign, McCarthy's staff, and the staff of the *Washington Times-Herald*, a newspaper.[17] The committee's report, issued in August, condemned the actions of Butler, Butler's campaign, and McCarthy, but it took no formal action against Butler other than fining his campaign manager $5,000, believing further action to be unfair in the absence of rules governing campaign conduct.[18] Instead, the committee called for the creation of rules to establish fair campaign standards.

In the rest of this paper, I will dig into the report of the committee and into the depths of the hearing transcripts themselves. What was it about the composite photograph in particular that attracted the interest, and condemnation, of both Tydings and the committee? How can answering this question help us understand our primary research questions about how photographs shaped the forms of life?

[15] "A Declaration of Conscience."
[16] U.S. Senate, Committee, *Report*, 1.
[17] U.S. Senate, Committee, Subcommittee, *Hearings*.
[18] "The Election Case."

## 2.3. Trustworthy Photographs

In their final report, the committee is clear that it disapproves of the tabloid "From the Record" as a whole. They write that it "contains misleading half truths [sic], misrepresentations, and false innuendos that maliciously and without foundation attack the loyalty and patriotism not only of former Senator Millard Tydings . . . but also the entire membership of the Senate Armed Services Committee in 1950," and that "The tabloid, disregarding simple decency and common honesty, was designed to create and exploit doubts about the loyalty of former Senator Tydings."[19] The tabloid was a subject of extensive investigation; in a 74-page report, 8 entire pages—over 4,000 words—are devoted purely to describing the contents, inception, production, distribution, authorship, and financing of the tabloid.[20] In his testimony, Tydings is also clear in his disapproval of the tabloid as a whole. He describes various stories and claims included in the tabloid as "a tissue of lies from beginning to end," "pure hog wash," and "a scurrilous, scandalous, and deliberate lie," and he accuses those involved in creating and distributing the tabloid of "moral squalor" and of being "dishonorable conspirators and perpetrators."[21]

However, both emphasize their disapproval of the composite photo in particular. Employing no small amount of strong language, the committee writes, "Reference to the now infamous composite picture is hardly necessary with the universal condemnation that it has received as a result of the subcommittee's public hearings. It was even too odious for campaign manager Jonkel who [sic] told the subcommittee that he had disapproved of it."[22] Additionally, the composite picture "was a shocking abuse of the spirit and intent of the first amendment to the

[19] U.S. Senate, Committee, *Report*, 4.
[20] U.S. Senate, Committee, *Report*.
[21] U.S. Senate, Committee, Subcommittee, *Hearings*, 9–12.
[22] U.S. Senate, Committee, *Report*, 6.

Constitution."[23] And Tydings, referring to the composite photo, testifies, "here is a case where the evil intentions and wicked designs of the conspirators who assembled this lying pamphlet were caught red-handed, and I mean red-handed; there is no maybe so about it."[24] A brief close reading of Tydings's language reveals that he believes something is special about the composite. Much of the content of tabloid is morally condemnable, but *here*—in the composite photograph—*here* is where the immorality is caught definitively "red-handed." To Tydings, something about the composite photograph conclusively and indisputably proves the guilt of its creators. Why?

Tydings is concerned about the persuasive power photos hold over the public and how it can be misused. In his testimony at the beginning of the hearings, Tydings says,

> Some of them [the "conspirators" who assembled the tabloid] have since confessed that the picture was manufactured and faked. Of course, the word "composite" was stated but we all know that the word "composite" is not generally used or even understood by many people. Likewise, we all know that one picture is worth a thousand words. If you see it in a picture, 99 percent of the people say it must be so.[25]

In other words, it is true that the photo was labeled a composite, which gives the creators of the tabloid and photograph grounds for arguing that the composite was not an outright lie. However, Tydings objects to the photo because he believes that most people will believe it to accurately reproduce an exchange that occurred at the hearings, making it effectively a lie because no such exchange occurred. "If you see it in a picture, 99 percent of the people say it must be so."

To understand this in a slightly different way, Tydings recognizes that photographs have a transformative effect in the world, changing how people form beliefs about what is true. Philosopher of technology Langdon Winner may help us understand and interpret this. In his

[23] U.S. Senate, Committee, *Report*, 4.
[24] U.S. Senate, Committee, Subcommittee, *Hearings*, 13.
[25] U.S. Senate, Committee, Subcommittee, *Hearings*, 13.

article "Technologies as Forms of Life," Winner argues that technologies transform everyday life by playing a mediating role in human activity.[26] "As technologies are being built and put to use," he writes, "significant alterations in patterns of human activity and human institutions are already taking place. New worlds are being made."[27] Technologies are more than just tools, argues Winner; they become part of our humanity, and they reshape the forms of life.[28]

How do photographs shape the forms of life? One possibility is that photographs are not merely tools that allow one to see snapshots of the world from other times and other places; photographs also fundamentally reshape certain human activities and institutions, such as the activity of forming a belief about the truthfulness of a claim. As one forms a belief about whether something is true, the availability and character of photographic evidence becomes part of that activity. Indeed, Tydings seems to provide evidence to support this. Towards the end of the hearings, he testifies again, providing this opinion: "I don't object to cartoons because people recognize cartoons for what they are. But when they see an alleged photograph, they have a right to believe it is an accurate photograph."[29] According to Tydings, not only do photographs change the activity of forming a belief about what is true, but they also hold a privileged place in that process. In a way that is totally different from other kinds of images, such as cartoons, photos are *trustworthy* evidence—and I mean trustworthy in the strongest sense. It is not just that photographs *tend* to be accurate or truthful sources of information about the world. Tydings asserts that photographs are *worthy* of trust—people have a "right" to believe that photos are accurate. In Tydings's view, photographs have fundamentally reshaped the forms of life.

[26] Winner, "Technologies as Forms of Life," 9.
[27] Winner, "Technologies as Forms of Life," 11.
[28] Winner, "Technologies as Forms of Life," 12–14.
[29] U.S. Senate, Committee, Subcommittee, *Hearings*, 1101.

The changed forms of life problematize the composite photograph. Because of the role photographs play in the formation of beliefs, a composite photo that does not accurately reproduce something in the world becomes concerning. Due at least in part to the trustworthiness that photos take on as a quality, a composite photo that breaks that trust is morally objectionable.

## 2.4. Objective Images

It is not clear that the committee holds the same view. As previously described, they also respond to the composite in their report with moral outrage. But what exactly are they outraged about? What is it about the composite photo that makes it wrong? It is hard to tell, because the report does not explain. However, we can pick up some hints in the hearings. Senator Hennings is concerned about new technologies and their potential for a new kind of unfair representation: while questioning Perry Patterson, an attorney who reviewed the tabloid and advised that it was not libelous, Hennings asks whether Patterson believes "that certain technological advancements, such as the television, or the ability to create composite photographs [sic] might create an increasing hazard and danger toward misrepresentation, such as the ability to project over the television screen you or me in conversation with a well-known Communist or gangster or criminal?"[30] Here he seems to share Tydings's concern that certain visual technologies, such as a television broadcast or a photograph, play an important role in the human activity of forming beliefs about the truthfulness of claims, and that misuse of these technologies is dangerous in its power to misrepresent. Hennings earlier asks Patterson to imagine a composite photo depicting Patterson and a "well-known gangster and hoodlum" he was examining as a witness close together; he asks Patterson whether that would be "precisely an accurate representation of your

[30] U.S. Senate, Committee, Subcommittee, *Hearings*, 335.

degree of intimacy with a criminal whom you happened to have been cross-examining."[31] Hennings—and other members of the committee, as it turns out—is concerned about the accuracy of photographs. Tydings and Hennings seem to share a conviction that photos should be accurate, and that inaccurate photos may not be "fair".[32] But what does it mean to them for a photo to be accurate?

Historians of science Lorraine Daston and Peter Galison can help us understand. Daston and Galison's book, *Objectivity*, accounts the development of objectivity as a value in science. In particular, they account a struggle that took place largely in the late nineteenth and early twentieth centuries between competing paradigms over the qualities of a good scientific image. The older paradigm, referred to by the authors as *truth-to-nature*, held that scientists should use their expertise to produce images that revealed the pure, idealized character of things; they cite Goethe, who wrote, "the human mind must fix the empirically variable, exclude the accidental, eliminate the impure, unravel the tangled, discover the unknown."[33] For example, a scientist might decide that snowflakes were, in their most pure form, perfectly symmetrical six-sided shapes, and they might then draw them as such, ignoring or excluding abnormalities.[34] What resulted, write Daston and Galison, was that "The type was truer to nature—and therefore more real—than any actual specimen."[35] The newer paradigm, referred to by the authors as *mechanical objectivity*, held that scientists should repress their subjective intervention in image creation, by using a strict set of procedures to reproduce something in the world; the watchword of this movement, Daston and Galison write, was "Let nature speak for itself."[36] In order to

[31] U.S. Senate, Committee, Subcommittee, *Hearings*, 332.
[32] U.S. Senate, Committee, Subcommittee, *Hearings*, 332.
[33] Daston and Galison, *Objectivity*, 59.
[34] Daston and Galison, *Objectivity*, 150.
[35] Daston and Galison, *Objectivity*, 60.
[36] Daston and Galison, *Objectivity*, 120.

eliminate subjectivity as much as possible, image technologies such as the camera could be used to produce objective images procedurally.[37] For example, a scientist might photograph snowflakes, intending to capture a full variety of forms, including irregularities and asymmetry.[38]

A version of this same struggle over images takes place over the course of the hearings. The members of the committee seem to assume that accuracy and fairness of representation are qualities that result from objectivity. They appear concerned about the extent to which the composite photograph is not an objective image. In some sense, it is obvious that the composite is not an accurate image—it depicts an event that, visually speaking, never happened. But even this is problematized in terms of its violation of objectivity—the construction of a composite image introduces more opportunities for subjective interpretations to become embodied in the image. This is revealed through the numerous questions asked by committee members about choices made during the construction of the composite. The following section is a transcript of Senator Monroney questioning Patterson:

> Senator MONRONEY. Well, did you inquire as to the distance between the two at the time the photograph was taken of Mr. Browder, or the position of the men?
>
> Mr. PATTERSON. No; I did not.
>
> Senator MONRONEY. Or whether it would involve any change in the rearranging and bringing of the two into conversation?
>
> Mr. PATTERSON. Well, I did not think that the physical intimacy in any way would bear on the libelous aspects of it at all.[39]

Monroney is interested in whether the physical distance between Tydings and Browder depicted in the composite accurately reproduces the distance in the actual hearings, which of course it did not.

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[37] Daston and Galison, *Objectivity*, 121.
[38] Daston and Galison, *Objectivity*, 150–151.
[39] U.S. Senate, Committee, Subcommittee, *Hearings*, 331.

This line of questioning—whether choices were made during the creation of the composite to depict some subjective interpretation of the attitude or association between Tydings and Browder—is repeated throughout the hearings. Here is another transcript of Monroney questioning Frank Smith, who prepared the tabloid and claimed that the intention behind creating the composite photo was not to deceive anyone, but merely "a technical solution to a space problem"[40]:

> Senator MONRONEY. Was there any discussion regarding the composite picture that you had with Mr. Tankersley as to its use, other than what you described, that it was merely a matter of convenience and make-up to balance the page and not separate the pictures?
>
> Mr. SMITH. That is all it was.
>
> Senator MONRONEY. There was no thought whatsoever of showing a more intimate association of Senator Tydings and Earl Browder?
>
> Mr. SMITH. Not in my mind, no, sir.[41]

Monroney asks variations on these questions nine times in a row. "It was perfectly coincidental only for the fact that page limitation on the tabloid that those two were grouped together instead of being shown separately?" "You had no desire to get any particular attitude shown by Senator Tydings?" "But there was no effort made whatever to have Senator Tydings pictured in an expression that showed close association and perhaps affection for Earl Browder?"[42] And so on. What these questions seem to be getting at is that there are choices made during the production of a composite—which photos to choose, containing what expressions, how to arrange the elements of the photos in physical relation to one another—that embed subjective interpretations, such as the character of the relationship between Tydings and Browder, into the composite photo.

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[40] U.S. Senate, Committee, Subcommittee, *Hearings*, 371.
[41] U.S. Senate, Committee, Subcommittee, *Hearings*, 385.
[42] U.S. Senate, Committee, Subcommittee, *Hearings*, 386.

In response, several of those involved in creating the composite reject the assumption that accuracy and fairness of representation in photos result from objectivity. They accept that the artists' subjective interpretations were embedded in the composite photograph, and they argue that, due to these subjective interpretations, the composite was actually truer than any photograph of the hearings that existed. Senator McCarthy, in a separate statement, wrote the following:

> I readily agree that composite photographs in general are improper and are to be condemned in political campaigns. Fortunately, in this particular instance, however, the composite photograph of Tydings and Browder did not as a matter of fact misrepresent the attitude of the former Senator from Maryland toward the notorious Communist leader. For example, toward the end of Browder's testimony, Senator Tydings resorted to cajolery in a desperate effort to get the Communist leader to answer a question concerning the Communist Party membership of John Carter Vincent and John Stewart Service.
>
> . . .
>
> No composite photograph could adequately depict this exchange between Tydings and Browder.[43]

McCarthy seems to mean that no photograph at all could adequately depict the character of the exchange between Tydings and Browder, but the composite was closer than any existing photograph. Recall Daston and Galison's words, "The type was truer to nature—and therefore more real—than any actual specimen." In this case, the composite is not truer to nature than the exchange itself, but McCarthy argues that it is truer to nature than any photo produced conventionally. Similarly, Garvin Tankersley, an expert in photos who directly supervised the production of the composite, explains what the composite photo was intended to achieve: " . . . you all know his [Senator Tydings's] manner to Mr. Browder and Mr. Browder's manner to him—I don't have to repeat all of that—but we wanted to show that Mr. Tydings did treat Mr.

[43] U.S. Senate, Committee, *Report*, 46.

Browder with kid gloves . . . "[44] Again, Tankersley claims the composite photo depicts the character and attitude of the exchange more truly than any other photo. Just as two paradigms clashed over good scientific images, two paradigms have clashed over acceptable political photographs.

A closer analysis of Tankersley's testimony can help us refine our understanding of how this struggle developed and what exactly it was. At the beginning of his testimony, Tankersley states that the purpose of creating the composite was to illustrate a quote spoken by Tydings to Browder during Browder's testimony. Tankersley says, "All through the hearings, the thing, the quote stands out in my mind more than anything, 'Oh, thank you, sir.' This, 'Oh, thank you, sir,' and we wanted to get an illustration to carry that quote. . . . I looked at this thing as an illustrator, to dress the page up, and to illustrate a point. So I wanted to illustrate that picture to carry that."[45] Edward McDermott, the chief counsel to the committee, asks why he chose to create a new composite photograph, rather than use an existing photo of Tydings and Browder from the hearings. Tankersley initially answers that he wanted to get the two close together so that they would be recognizable. McDermott follows up by asking, along a line of questioning familiar to us now, "Were you interested in their expressions?"[46] Over a course of numerous questions, Tankersley answers that he chose the component photos of the composite and arranged them in such a way as to effectively convey a character of the relationship between Tydings and Browder.

However, the committee does not stop questioning here. Senator Hennings brings the conversation back to Tankersley's stated purpose of illustrating a quote. He asks Tankersley

[44] U.S. Senate, Committee, Subcommittee, *Hearings*, 394.
[45] U.S. Senate, Committee, Subcommittee, *Hearings*, 389.
[46] U.S. Senate, Committee, Subcommittee, *Hearings*, 390.

whether he has read the transcript and heard recordings of the hearings, and he asks Tankersley to explain what sort of "implications of the phrase, 'Oh, thank you, sir'" he had intended to illustrate: "Or, 'Oh, thank *you*, sir.' Or, 'Oh, *thank* you, sir.'—just what intonation or emphasis did you place on that verbage, not having read it—I take it you had not read it?"[47] Tankersley replies that he has read and heard that part of the hearings.[48] Hennings continues asking Tankersley how he interpreted the quote, explaining that "by way of emphasis, there are a good many ways of saying, 'Oh, thank you, sir'—sometimes with irony, sometimes with an implication of gratitude and thanks, and with sarcasm."[49] Tankersley answers that he interpreted relief, not sarcasm, in Tydings's voice.[50] Hennings's final question is "That was your view?"[51]—the choice of words "your view" indicating that he understands this to be Tankersley's subjective perspective. Finally, McDermott summarizes the understanding of the committee:

> Do I correctly understand your explanation of this now, Mr. Tankersley, that you made this ultimate selection based on the expressions of the two men in the photographs that you ultimately used, and you used the composite because you were desirous of showing them closer together physically than they appeared in any news photograph that was available to you for use in this tabloid?[52]

Tankersley confirms the intention of showing Tydings and Browder closer together physically. He ignores the question about their expressions.

### 2.5. The Moral Character of Composite Photographs

Tankersley' testimony helps us better understand how at least some members of the committee understand the composite photo to be subjective. The composite is intended to

[47] U.S. Senate, Committee, Subcommittee, *Hearings*, 395.
[48] U.S. Senate, Committee, Subcommittee, *Hearings*, 395.
[49] U.S. Senate, Committee, Subcommittee, *Hearings*, 396.
[50] U.S. Senate, Committee, Subcommittee, *Hearings*, 396.
[51] U.S. Senate, Committee, Subcommittee, *Hearings*, 396.
[52] U.S. Senate, Committee, Subcommittee, *Hearings*, 396.

illustrate a quote spoken by Tydings to Browder during the investigation into McCarthy's allegations of Communist infiltration. The quote is taken verbatim from those hearings, but the composite is also intended to illustrate a subjective interpretation of Tyding's words as relieved, rather than sarcastic or some other tone. The mechanism by which this subjectivity becomes embodied in the composite photograph is in a series of choices made during the process of creating a composite—choices of which photos to combine, with all the potential factors involved such as the expressions on Tyding's and Browders's faces, and choices of how to physically cut and rearrange the component photos in physical relation to one another. I believe that the substantial focus on this subjectivity during the hearings, combined with the committee's moral condemnation of the composite photograph, is convincing evidence that the committee holds a similar view to that of Tydings on the way photographs shape the forms of life. Photographs play an important role as trustworthy evidence in the activity of forming beliefs about the truthfulness of claims, and to break that trust is morally wrong. What the committee adds to this understanding is an association of truth with objectivity. When the objectivity of photographs is compromised—as in the case of the composite in the tabloid "From the Record"—so is their truthfulness, and people's trust in photographs becomes misplaced and dangerous.

Tydings and the committee both respond by attempting to secure the objectivity of photographs with a moral condemnation of the composite photo and a call for rules and laws to govern the use of composite media in campaigns. When Senator Smith asks, "Can you tell us at this time how you would outlaw composite pictures such as that in the tabloid?" Tydings replies, "I think I could generally. I would simply make it an offense where photographs were taken out

of their real context."[53] He argues that voters deserve every possible protection needed to secure an "honest ballot box" and to punish campaigns of "deceit and fraud" and warns that action is needed in a new "mass-production age."[54] The committee, in its final report, recommends legislation illegalizing composite pictures that "maliciously misrepresent facts and without justification create and exploit doubt about the loyalty to his country of an opposing candidate," as well as legislation going beyond only pictures:

> The subcommittee recommends legislation outlawing all composite pictures in campaigns which would be designed to misrepresent or distort the facts regarding any candidate. In the drafting of such legislation, consideration should be given to all types of "composites," whether they be newspaper pictures, voice recordings, motion pictures, or any other means or medium of conveying a misrepresenting composite impression."[55]

The outcomes of these attempts to secure the objectivity of photos in campaigns is a task for further research.

### 2.6. Why Does This Matter, Anyway?

Why does all this matter? Why is it important that we understand what exactly Tydings and the committee objected to in the composite photograph, or how those involved in creating it defended it? Sure, maybe subjective interpretations embedded in the composite were an issue for the committee—but at the end of the day, aren't they objecting because it was a particularly new and perhaps convincing part of a massive campaign to deceive and mislead voters? And how does any of this help us with the problem of deepfakes?

I argue the significance of this case study lies more in the processes undertaken by the committee of asking questions, debating intentions and meanings, and determining a moral

[53] U.S. Senate, Committee, Subcommittee, *Hearings*, 390.
[54] U.S. Senate, Committee, Subcommittee, *Hearings*, 1100.
[55] U.S. Senate, Committee, *Report*, 8.

judgment than in the actual objections of the committee. It is not and never has been entirely clear what it means for a photograph to mislead or deceive, or how to determine the moral character of a photograph. In an article about deepfakes, Joshua Rothman of *The New Yorker* writes,

> Not all synthetic media is dystopian. Recent top-grossing movies ("Black Panther," "Jurassic World") are saturated with synthesized images that, not long ago, would have been dramatically harder to produce; audiences were delighted by "Star Wars: The Last Jedi" and "Blade Runner 2049," which featured synthetic versions of Carrie Fisher and Sean Young, respectively. Today's smartphones digitally manipulate even ordinary snapshots, often using neural networks: the iPhone's "portrait mode" simulates what a photograph would have looked like if it been taken by a more expensive camera. Meanwhile, for researchers in computer vision, A.I., robotics, and other fields, image synthesis makes whole new avenues of investigation accessible.[56]

In this case study from 1950, there are no clear answers. The photograph, after all, was labeled a composite in the caption. It never claimed to be an accurate visual reproduction of what happened at the hearings. And yet, Tydings and the Senate committee still found something deeply immoral about it.

Each of us may not be talking about the same things when we talk about photographs—not only in the sense of what a photo is technically, but also its place in the world, and how it fits into our activities and institutions. In order to talk about deepfakes, we need to start by questioning and discussing what exactly we mean by videos—or "fake videos," or "deepfakes"—in the first place. How do they shape the forms of life in our world? How do we *want* them to shape the forms of life in our world? Some express concern that deepfakes will unravel the role recorded videos played in constructing shared truths—think of politicians caught expressing controversial opinions on video, or instances of police brutality recorded and shared through video.[57] In a time of polarization in the U.S., it's already difficult enough for people to

[56] Rothman, "In the Age of A.I., Is Seeing Still Believing?"
[57] Foer, "The Era of Fake Video Begins."

agree on what the world is like. We need to address this concern—as well as all of the other concerns and problems deepfakes have begun raising. But in order to do this, we first need to negotiate a shared understanding of what videos are—and what roles they play in our world, and what roles we want them to play in our world. Perhaps history can help.

# Chapter 3: On Deepfakes

In this section, I lay the foundations for building a critical understanding of deepfakes, by discussing the difficulty of defining the term, the workings of deepfake technologies, a brief history of deepfakes, and an overview of concerns and responses to deepfakes. I have incorporated information from the history section presented below into the Wikipedia article on deepfakes.[58] My edits, under the username "Oatnewguo," can be found here: https://xtools.wmflabs.org/topedits/en.wikipedia.org/oatnewguo/0/Deepfake. Editing the Wikipedia article is an ongoing project.

## 3.1. Definition

There's no good definition for the term *deepfakes*. Many projects seem to be associated with deepfakes, but they exhibit a considerable deal of variation. They accomplish fundamentally different tasks, are developed by and shared among different communities, are undertaken with different motives, and rely on different underlying technologies and software. Rather than start with a definition, I will provide some examples to sketch out a sense of what kinds of things seem to be associated with deepfakes.

Clearly a deepfake: a pornographic video shared on the online community Reddit that has been edited by a computer program to depict a celebrity's face on a pornographic actress's body. This is, after all, the origin of the term deepfakes.[59] Also seemingly a deepfake: a video depicting former president Barack Obama speaking the words of an impersonator, generated using a program that had learned patterns from Obama's weekly video addresses.[60,61] Less clear: a selfie

[58] "Deepfake."
[59] Cole, "AI-Assisted Fake Porn Is Here and We're All Fucked."
[60] Suwajanakorn, Seitz, and Kemelmacher-Shlizerman, "Synthesizing Obama."
[61] O'Sullivan, "When Seeing Is No Longer Believing."

video edited using a digital filter developed by Snap Inc., the company that owns the messaging app Snapchat. Many would likely agree that it depends on whether the filter's purpose was to brighten the photo, to simulate lipstick and eyeliner, or to swap one's own face with another's.[62]

These examples raise questions about whether there is a certain kind of fakeness that makes a video a deepfake. Does a video need to involve mixing or alteration of human bodies? Can a video with no human subject be a deepfake? There are also questions of whether there is a certain reliance on deep learning, or computer-automated processes in general, that makes a video a deepfake. Video editing was practiced in the film industry long before the term deepfakes was coined; for example, historical footage was edited in the 1994 film *Forrest Gump* to depict the main character meeting former president John F. Kennedy.[63] When this editing is done frame-by-frame by professional video editors, it seems that most people would not say the result is a deepfake. How much reliance on computer-automated processes is needed for a video to be a deepfake?

As we see, there are substantial unanswered questions concerning the boundaries of what counts as a deepfake. For this reason, it is perhaps best to understand deepfakes as a family of associated artifacts without clear, unifying qualities. However, for the purposes of this thesis, I will be thinking of deepfakes as videos that, using machine learning, have been generated or altered such that the content of the altered video is substantially different from that of the original. The use of machine learning should change the activity of generating or altering a video such that creating a realistic video becomes accessible to people who would not reasonably have been able to create a realistic video using traditional video editing tools. And deepfakes usually concern human subjects, though this is not a hard rule.

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[62] Price, "The Full Snapchat Filters List"
[63] Kronke, "Movie Puts the Unreal into Newsreels."

### 3.2. How Do Deepfakes Work?

Deepfakes typically rely on some form of machine learning. Machine learning describes a family of techniques by which computer programs learn to perform a task.[64] Importantly, machine learning automates the process of figuring out how to perform the task. It commonly involves providing a program with a large dataset of examples, called a training set, which the program uses to find patterns and build a model of how to perform the task on new data in the future. Deepfakes are named after deep learning, an increasingly popular form of machine learning that has been used successfully to deal with complex data,[65] although not all deepfakes use deep learning.

As an example, let us investigate FakeApp, one of the most widely used programs for creating deepfakes.[66] FakeApp takes images of a person's face and superimposes that person's face on top of a different person's face in a separate video, effectively allowing users to alter videos to replace one person's face with another's.

How does FakeApp work? A user of FakeApp provides the program with large sets of photos of two people's faces, and FakeApp automatically identifies meaningful features in these images.[67] Of course, a computer program doesn't understand meaningfulness or interpret images in the same way as humans. What this means is that FakeApp analyzes the computer data that represents each image, and by analyzing all of the images it is provided, it identifies aspects of

[64] Louridas and Ebert, "Machine Learning."
[65] LeCun, Bengio, and Hinton, "Deep Learning."
[66] Zucconi, "An Introduction to DeepFakes."
[67] Zucconi, "An Introduction to DeepFakes."

these representations that distinguish them well from representations of other faces within the sets of images provided.[68] If this works well, then FakeApp will identify features that correspond well to facial features that we find meaningful, such as facial expression. FakeApp also generates two separate "decoder" processes—one for each person whose face images were provided—that take the meaningful features identified in an image of a person's face and convert them back into an approximation of the original face image.[69] Once this work has been done, FakeApp can take new images of these two people's faces, find the meaningful features in them, and use the other person's decoder to create a replacement image that preserves the original facial expressions but depicts the other person's face.[70] FakeApp essentially creates deepfakes by finding images of a face in a video and replacing it like this in every single frame.

Some current deepfake programs use a machine learning technique called a generative adversarial network, or GAN. The essential concept of a GAN is that a machine learning program that generates content, like FakeApp, is trained in tandem with another machine learning program that attempts to distinguish content generated by the first program from real content.[71] The results of these attempts are then used to retrain the first program to generate content that is more similar to real content.[72] GANs can enable machine learning to work well even when there is not a lot of training data.[73]

### 3.3. History

[68] Zucconi, "An Introduction to DeepFakes."
[69] Zucconi, "An Introduction to DeepFakes."
[70] Zucconi, "An Introduction to DeepFakes."
[71] Giles, "The GANfather."
[72] Giles, "The GANfather."
[73] Giles, "The GANfather."

The development of deepfakes can be separated into two settings: academic research and development by members of online communities like Reddit. Academic research related to deepfakes lies predominantly within the field of computer vision, a subfield of computer science often grounded in artificial intelligence that focuses on computer processing of digital images and videos.

An early landmark project was the Video Rewrite program, published in 1997, which modified existing video footage of a person speaking to depict that person mouthing the words contained in a different audio track.[74] It was the first system to fully automate this kind of facial reanimation, and it did so using machine learning techniques to make connections between the sounds produced by a video's subject and the shape of their face.

Contemporary academic projects have focused on creating more realistic videos and on making techniques simpler, faster, and more accessible. The "Synthesizing Obama" program, published in 2017, modifies video footage of former president Barack Obama to depict him mouthing the words contained in a separate audio track.[75] The project lists as a main research contribution its "photorealistic" technique for synthesizing mouth shapes from audio. The Face2Face program, published in 2016, modifies video footage of a person's face to depict them mimicking the facial expressions of another person in real time.[76] The project lists as a main research contribution the first method for reenacting facial expressions in real time using a camera that does not capture depth, making it possible for the technique to be performed using common consumer cameras.

[74] Bregler, Covell, and Slaney, "Video Rewrite."
[75] Suwajanakorn, Seitz, and Kemelmacher-Shlizerman, "Synthesizing Obama."
[76] Thies et al., "Face2Face."

Turning to online communities, we find that the term deepfakes originated around the end of 2017 from a Reddit user named "deepfakes."[77] He, as well as others in the Reddit community r/deepfakes, shared deepfakes they created; many videos involved celebrities' faces swapped onto the bodies of actresses in pornographic videos,[78] while non-pornographic content included many videos with actor Nicolas Cage's face swapped into various movies.[79] In December 2017, Samantha Cole published an article about these deepfakes in *Motherboard* entitled "AI-Assisted Fake Porn Is Here and We're All Fucked," which drew the first mainstream attention to deepfakes being shared in online communities.[80] The massive increase in public attention on these deepfakes that resulted was accompanied by an increase in spread of the deepfakes themselves; six weeks later, Cole wrote in a follow-up article, "Since we first wrote about deepfakes, the practice of producing AI-assisted fake porn has exploded."[81] In February 2018, r/deepfakes was banned by Reddit for sharing involuntary pornography, and other websites have also banned the use of deepfakes for involuntary pornography, including the social media platform Twitter and the pornography site Pornhub.[82]

Other online communities remain, however, including Reddit communities that do not share pornography, such as r/SFWdeepfakes (short for "safe for work deepfakes"), in which community members share deepfakes depicting celebrities, politicians, and others in non-pornographic scenarios.[83] Also remaining are online communities that do continue to share pornography, on sites such as 4chan, 8chan, and Voat—sites that have been associated with alt-

[77] Cole, "We Are Truly Fucked."
[78] Cole, "AI-Assisted Fake Porn Is Here and We're All Fucked."
[79] Haysom, "People Are Using Face-Swapping Tech to Add Nicolas Cage to Random Movies."
[80] Cole, "AI-Assisted Fake Porn Is Here and We're All Fucked."
[81] Cole, "We Are Truly Fucked."
[82] Hathaway, "Here's Where 'Deepfakes,' the New Fake Celebrity Porn, Went."
[83] "r/SFWdeepfakes."

right movements.[84] In addition, various programs similar to FakeApp have been developed, including faceswap[85] and OpenFaceSwap.[86] Deepfakes continue to proliferate online.

### 3.4. Concerns and Responses

Many have expressed concerns about harms that could be caused by deepfakes, in addition to the many concerns already mentioned regarding involuntary pornography. Hany Farid, a computer scientist specializing in photo and video forensics, argues in an interview with National Public Radio that deepfakes could threaten security by depicting a nation's leader claiming to have launched nuclear weapons, leaving governments very little time to evaluate the authenticity of the video and respond to such a serious claim.[87] He also argues that they could be used to manipulate democratic elections: for example, a video could be circulated falsely depicting a politician saying something embarrassing or offensive.[88] One article in *The Hill* describes lawmakers' worries that foreign governments might use deepfakes to manipulate the American public, and that bad actors might target children using deepfakes depicting people they trust.[89]

Thus far, the primary implemented solution addressing concerns with deepfakes has been platform-specific bans on certain uses of deepfakes, such as the Reddit, Twitter, and Pornhub bans. However, as we discussed, not all platforms hosting communities sharing pornographic deepfakes have chosen to enact such bans.[90]

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[84] Hathaway, "Here's Where 'Deepfakes,' the New Fake Celebrity Porn, Went."
[85] Zucconi, "An Introduction to DeepFakes."
[86] Knight, "Fake America Great Again."
[87] Cornish and Kelly, "Tracking Down Fake Videos."
[88] Cornish and Kelly, "Tracking Down Fake Videos."
[89] Breland, "Lawmakers Worry about Rise of Fake Video Technology."
[90] Hathaway, "Here's Where 'Deepfakes,' the New Fake Celebrity Porn, Went."

Some technological solutions are in development to address these concerns. The Pentagon's Defense Advanced Research Projects Agency (DARPA) has begun work on a project called Media Forensics, which aims to develop tools that can detect deepfakes by analyzing videos for audiovisual discrepancies, such as inconsistencies in lip movements.[91] Farid is currently working with a graduate student on a different forensics approach: in preparation for the 2020 U.S. presidential election, they are developing tools personalized to politicians that would detect deepfakes of that specific politician.[92] However, even as these solutions are being developed, new deepfakes are being made that defy them: less than a month after computer science researcher Siwei Lyu developed a forensics tool that detected deepfakes by looking for inconsistent blinking, someone had created deepfakes with realistic blinking.[93]

A different approach on the technological side is verified cameras—cameras or camera programs that save information about a video at time of recording, in such a way that videos can be verified in the future as not deepfakes. Truepic, for example, is a company that verifies photos taken through the Truepic app, storing information about the photos that can later be checked to determine if they have been altered;[94] although it does not deal with videos yet, Truepic received $8 million in funding in 2018, and it plans to develop methods of addressing problems with deepfakes.[95] However, this kind of solution would not be able to determine if a video was a deepfake or not, if the video was not taken using a verified camera.

Legal solutions have also been proposed. In the U.S., certain laws already provide people with legal options in various scenarios; David Greene at the Electronic Frontier Foundation

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[91] Hatmaker, "DARPA Is Funding New Tech."
[92] Metz, "The Fight to Stay Ahead of Deepfake Videos."
[93] Metz, "The Fight to Stay Ahead of Deepfake Videos."
[94] Constine, "Truepic Raises $8M to Expose Deepfakes."
[95] "Truepic Closes $8 Million Series A Funding."

argues that these are adequate for remedying the potential harms caused by deepfakes.[96] He lists several existing avenues for legal recourse, through criminal law in cases of extortion and harassment, and through civil law in cases of invasion of privacy, defamation, infliction of emotional distress, and more.[97] On the other hand, law professors Bobby Chesney and Danielle Citron analyze the potential for legal recourse against creators of deepfakes as substantial in some contexts but limited in others, and they point out that civil claims may be inadequate considering the harm that could be done by a deepfake if it goes viral or leads to violence.[98] They also analyze existing avenues for suing platforms for allowing harmful deepfakes; however, they argue that it will likely be difficult to strike a balance that both prevents harm and avoids reducing the benefits and rights of free speech, such as parody, too broadly.[99] Finally, deepfake-specific laws may be passed, in an attempt to deal with these issues. A couple laws have been proposed in state and federal legislatures in the U.S., and it remains to be seen whether they will pass and, if so, what effect they will have.[100]

In the meantime, much of the response consists of continued public attention on deepfakes. Notably, filmmaker and comedian Jordan Peele partnered with BuzzFeed in 2018 to create a public service announcement video that was circulated on YouTube, advising viewers to think critically about what they see online; the video took the form of a deepfake depicting Obama speaking the words Peele was voicing behind the scenes.[101]

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[96] Greene, "We Don't Need New Laws for Faked Videos."
[97] Greene, "We Don't Need New Laws for Faked Videos."
[98] Chesney and Citron, "Deep Fakes: A Looming Challenge," 34–36.
[99] Chesney and Citron, "Deep Fakes: A Looming Challenge," 36–41.
[100] Waddell, "Lawmakers Are Finally Taking Notice."
[101] BuzzFeedVideo, *You Won't Believe What Obama Says In This Video!*

# Chapter 4: Developing a Critical Teaching Module on Deepfakes

I developed a teaching module with the aims of guiding students to think critically about photos and videos, and of raising awareness of deepfakes. I modeled my teaching module on the "plug-and-play" teaching modules developed by Shannon Vallor and collaborators on topics such as software engineering ethics.[102] The module is a plan for a series of student activities, broken into four sections, each with a reading or activity followed by a set of homework questions. Teachers can choose to cover all sections or some, and the module is designed to be teachable over two, three, or four class periods. The teacher need not be an expert on deepfakes or in the field of STS. The intended audience is high school or college students; discretion is advised, as material in the third section discusses deepfakes that involve people's faces edited into pornographic videos without their consent.

Although the current design of the module does not include in-class activities, I believe that discussion is critical to building a rounded understanding of the issues discussed in the readings. The questions can be starting points for in-class student discussion. In addition, the readings can be adapted as teacher-led discussions or lectures in class. I suggest the following plans for teaching the module, depending on the number of class sessions:

- **4 CLASS SESSIONS (light workload)**
  - **Day 1:** Part 1 (Reading and Questions) + in-class discussion
  - **Day 2:** Part 2 (Reading and Questions) + in-class discussion
  - **Day 3:** Part 3 (Reading and Questions) + in-class discussion
  - **Day 4:** Part 4 (Activity and Questions) + in-class discussion

- **3 CLASS SESSIONS (light workload)**
  - **Day 1:** Part 1 (Reading and Questions) + in-class discussion
  - **Day 2:** Part 2 (Reading and Questions) + in-class discussion
  - **Day 3:** Part 3 (Reading and Questions) + in-class discussion + in-class exploration of Part 4 (Activity and Questions)

[102] Vallor and Narayanan, "An Introduction to Software Engineering Ethics."

- **<u>2 CLASS SESSIONS (heavy workload)</u>**
    - **Day 1:** Parts 1 (Reading) and 2 (Reading and Questions) + in-class discussion
    - **Day 3:** Parts 3 (Reading and Questions) and 4 (Activity and Questions) + in-class discussion

Teachers are encouraged to make their own plans or alter the design of the curriculum as they see fit. Before making changes, though, it should be noted that Parts 1, 2, and 3 do build on each other.

I identified three goals for learning outcomes by the time students complete the module.

1. **Awareness:** Students should be aware of deepfakes, as well as potential harms associated with deepfakes and proposed solutions to mitigate harms, technological and otherwise.

2. **Media literacy:** Students should be able to critically evaluate, rather than naïvely accept, the reliability of photos and videos as evidence.

3. **STS tools:** Students should be able to think about technologies through the lens of how they shape the forms of life, though not necessarily in exactly the same way or using the same vocabulary as Winner does in paper "Technologies as Forms of Life." Students should be able to apply this critical lens to photos, videos, deepfakes, and other technologies.

The full teaching module follows. Supplementary readings and other materials have been submitted with this thesis in separate files.

## 4.1. Media Literacy in the Age of Deepfakes: An Introduction

Welcome to this introductory learning module on media literacy in a world of new and changing technologies! In this module, you will be guided to think critically about how you form beliefs about what is true. We'll examine the role of photographs and videos in particular, and then we'll discuss deepfakes, a new kind of technology related to videos. Finally, we'll take a look at some tools for digital media literacy. This module contains four parts; follow your teacher's instruction for when and how to complete them.

## 4.2. Part 1: Claims and Beliefs

### Reading

How do you know what is true? There are many ways you could answer this question. Taking a philosophical approach, you might ask what it means for something to be true, and you might question whether you can ever know for certain that something is true. Taking a neuroscientific approach, you might ask what your brain does when you're learning or thinking. Taking a media studies approach, you might ask how television, Facebook, and the books you read in school show you certain ways of understanding the world. However, we're interested in asking a different question. How do the people, institutions, and things around you play a role in whether you believe something to be true?

Let's define the term *claim*. When we talk about claims, we mean statements or stories whose truthfulness can be evaluated—even if the truthfulness is ambiguous. A claim could be as simple as a true-or-false statement: "farmers in the United States only plant radishes." Or it could be as complex as a narrative: a politician's message about how they will help farmers if they are elected. A claim could be about a local issue: "your pet cat prefers dog food." Or it could be

about a global issue: “the Earth’s climate is warming due to greenhouse gases in the atmosphere.” Claims can take all sorts of forms, and they can be found in all sorts of places!

Let’s rephrase our question in terms of claims. When you come across a claim, how do the people, institutions, and things around you play a role in whether you believe it or not? We should note that for something to play a role in your belief formation could mean many different things: you might consciously take something into account as you evaluate whether you believe a claim, or you might not even be aware that something is influencing your belief.

How might people play a role in whether you believe a claim? As social animals, we humans tend to be intensely aware of the people around us. Claims are often presented to us by people, whether that’s your family telling a story or a news reporter talking about the weather on TV. And claims are often about people, whether it’s your next-door neighbor or an international celebrity. We might have existing relationships with these people or ideas about them that affect whether we feel we can trust them, whether we think we should believe what they tell us, and what we believe is a reasonable claim about them.

How might institutions play a role in whether you believe a claim? By organizing people in certain ways and imposing rules upon them, institutions can create reputations that we learn to recognize when we are evaluating claims. One example of an institution is a newspaper. Many newspapers attempt to build the credibility of their claims by following certain journalistic standards, such as paying employees to check facts and correct mistakes in articles. In this way, a person reading an article has a way of evaluating the claims present in that article, even though they might not know anything about the author of the article or the situation described in it. Another example of an institution is a school. When a teacher makes claims in class, you might think about those claims differently than you would if they were not a teacher and you were not

in school; because they are a teacher, you know that they have a certain kind of education and training, that the claims they present are likely part of a curriculum developed by educational experts and legislators, and that they may be held accountable for teaching factually accurate information.

How might things play a role in whether you believe a claim? Various things, such as technological objects, can influence us in all sorts of ways. For example, objects can function as evidence. A photograph that depicts your friend meeting a celebrity provides evidence that they really did shake hands with a famous person. In a different way, the result of a DNA test might influence whether you believe a claim about where your ancestors are from, or it might convince a court jury of a defendant's guilt or innocence.

In addition, certain kinds of values and qualities might also play a role in whether you believe a claim. For example, if a person, institution, or thing seems biased to you, does that change how it affects what you believe about a claim? And what does it mean to be biased, anyway? A car dealer might want you to believe that a car is good so that they can sell it to you for profit; a news organization might publish stories from a conservative perspective because its funding comes from conservative sources; a computer program that recognizes people's faces might be very accurate at identifying people with lighter skin color but very inaccurate at identifying people with darker skin color. Is bias a person's own interest, an institution's political leaning, or a thing's discriminatory design? These are all legitimate ways in which bias might complicate how you form a belief about a claim.

If you're feeling skeptical of the way we're breaking down the process of how people form beliefs, you're justified in feeling that way. Not everything fits cleanly into one category or

another, and we're definitely missing other crucial factors, such as your own emotional state. However, you might find that this is one of many useful ways to approach our question.

To see how this works, we can look at an example. Suppose a friend tells you that an administrator at your school said that the budget for certain student programs was being cut. What sorts of factors influence whether you believe that claim is true? Your relationship with your friend might affect how much you trust them; your previous interactions with the administrator might create an idea in your mind of whether they would do something like that. You might ask others to see if other students' accounts corroborate your friend's claim. You might wait for evidence from an institution: maybe the school newspaper will report on the decision, or maybe an administrative office will email students about it. There might be things that influence your belief: maybe, someone was taking a video when the administrator spoke. You might be aware of biases, which might affect how these factors influence your belief—perhaps your friend personally dislikes the administrator, or perhaps the school newspaper is affected by the discussed budget cuts, or perhaps the video is short and you wonder whether it leaves out important context. In a situation like this, all of these factors and many more can come together to influence what you believe.

It's interesting to note that these people, institutions, and things are often more than merely additional factors that influence whether or not we believe a claim. In many cases, they can become integral parts of the process of developing beliefs about claims. A child may rely on their parents to inform them of what to believe; when you hear a story about something that happened, your first reaction may be to see if a news institution you consider reputable has reported on it; if a friend tells you they caught a large fish, you may demand to see a photo

before you believe them. In this way, the people, institutions, and things around us can dramatically change what it is like to develop beliefs about claims.

**Questions**

1. In the next few days, pay attention to what goes through your mind when you come across claims. For this assignment, write about one instance between now and the next class in which you encountered a claim. Answer the following questions:
    a. Did you believe the claim? Can you identify factors that affected whether or not you believed it?
    b. Can you think of other factors that weren't present that might have made the claim more or less believable?
    c. Do you think that you thought about the claim any differently than you normally would have, because of this assignment? Or do you think this was typical of how you react to claims?

## 4.3. Part 2: Artifacts – Photos and Videos

**Reading**

Let's continue the discussion from last time, with a focus on technological objects, or *artifacts*. We define an artifact as some object that is either created by humans, such as a chair or a phone, or involved in an activity created by humans, such as a flint rock used for starting fires. Artifacts may not be obviously physical objects—digital photographs and passwords, for example, could be considered artifacts—but they are distinct items. For example, a post or a

"like" button on Facebook is an artifact, but social media is not: I can't refer to "a social media" in the same way I can refer to "a post" or "a 'like' button."

Artifacts are often parts of larger technological systems that involve people, institutions, and other artifacts. Certain practices and rules may be embedded within these systems that give artifacts different significance than they would have, if they existed outside of these systems. For example, we might interpret an individual Facebook post differently based on its resemblance to other Facebook posts, the reactions and comments it receives, or whether it violates any of Facebook's rules on civility and hate speech.

Recall the question we discussed in Reading 1: when you come across a claim, how do the people, institutions, and things around you play a role in whether you believe it or not? Let's focus specifically on photographs and videos. What role do photos and videos as artifacts play in this process of forming beliefs about claims?

One role that photos and videos might play is to act as privileged evidence—that is, pictures or videos are particularly important factors affecting whether people believe certain claims. Imagine this scenario: a parent wants to make sure their teenage child is really at their friend's house for a sleepover, not secretly out partying somewhere else. The parent might text their child to confirm that they are in fact at their friend's house, but they may not feel that they can trust this answer completely. Instead, the parent might ask their child to take a photo with their friend at the sleepover and share it, or the parent might ask to video chat with their child. For the parent, this requested photo or video chat might even be necessary evidence to believe that their child is at a sleepover: if their child ignores or refuses the request, then that may be a cause for suspicion. A photo or video can become a crucial factor in whether the parent believes their child's claim that they are at a friend's sleepover.

In general, what is it about a photo or a video that makes it into privileged evidence in many situations? There are several ways we might explain this. One explanation is that seeing something in a photo or video is a lot like the experience of seeing that thing yourself. In other words, usually, by looking at a photo, you see an image that looks similar to what you would see yourself if you were in the place of the camera when the photo was taken. The same is true of a video, which reproduces sound as well. Perhaps, this makes photos and videos particularly compelling as evidence.

Another explanation is that the quantity of information that photos and videos tend to capture can make it hard to frame, alter, or create a deceptive photo or video that does not include evidence of that deception. For example, if a child is trying to convince their parent that are not at a crowded party when they actually are, they could lie in a text message without even stepping outside, but a video chat would likely reveal flashing lights, loud music, or other people that would give them away. Perhaps, photos and videos are simply less likely to deceive because the reframing and editing needed to deceive convincingly using a photo or video are prohibitively difficult.

Do cameras reduce bias? On first thought, it seems like they do. When I draw a picture of some scene that I observe, I make decisions about how to draw it, from the shape of the sun to how much a person is smiling. When I write about that scene, I make decisions about how to describe it: I can describe the sun as “brilliant” or “blinding,” and I can consider whether to explicitly write that a person is smiling or to imply that by describing how they walk cheerfully. A camera takes many of these decisions out of the human’s hands and handles them mechanically. If you and I both take a photo of the same scene, the images will probably look much more similar than if we had both drawn a picture and compared. However, there still exist

many choices that a person can make about how to take a photo or video of something: at what moment and for what duration, how to visually frame it, whether and how to edit it, how to describe it if it is presented somewhere, and more. Two photos of an animal attacking a person may look very similar, but if one photo includes another person in the frame goading the animal and the other does not, then they are actually quite different photos.

Furthermore, bias can take forms other than individual choices. The camera technology itself, for example, can have bias embedded in its design—rather than reduce bias, this has the potential to introduce entirely new forms of bias. For example, during the early development of color photographs, color film was tested extensively by taking photos of white women; this has left a legacy that color photographs have historically been intended to make white skin look beautiful, while darker skin tones have not been taken into consideration. There is no easy answer to the questions of whether cameras reduce bias and how the bias of cameras may affect the role played by photos and videos in forming beliefs.

**Questions**

1. Repeat the exercise in the section Questions 1. When you consider claims and factors influencing your belief, though, focus especially on photos and videos. Do you find that photos and videos take on a role of privileged evidence? Something different?
2. Sometimes, the trustworthiness of photographs being used to support a claim is called into question very publicly. Pick one of the following historical case studies, complete the readings, and answer the questions:
    a. Cottingley Fairies

- Read this overview on the Cottingley Fairies story: http://time.com/4876824/cottingley-fairies-book/
- Read pages 13–29 of *The Coming of the Fairies*, a book about the photographs written in 1922 by Arthur Conan Doyle, the British author of *Sherlock Holmes*. In this section, Doyle guides the reader through his own process of evaluating the claim that the photos of the Cottingley Fairies are real photos of fairies.
    1. Can you identify factors that might have played a role in Doyle's belief that the photos are authentic? How do they relate to one another?
    2. How would you characterize Doyle's process of investigating these photos? Doyle had a long fascination with spiritualism and the paranormal, believing in communication with the dead, telepathy, and more. Do you think he saw what he wanted to see? Were his conclusions justified, given what he says he knew?

b. 1950 U.S. Senate race in Maryland

- Read the attached overview of the controversy surrounding the 1950 U.S. Senate election in Maryland.
- At the beginning of the hearings held by the Senate, Millard Tydings presented a statement. Read page 13 of the Senate hearings transcript except the last two paragraphs. In this section, Tydings argues that the composite photo depicting him with Earl Browder was immoral and wrong.

1. What does Tydings see as the role of photos play in what people believe as true?
2. How does he argue that the composite photo was wrong?

- Read pages 385–386 of the Senate hearings transcript, in which Frank Miller Smith, who prepared the tabloid, is being questioned by the senators. Also read page 394, in which Garvin Tankersley, who directly supervised the production of the composite photo, is being questioned by the senators.
    1. The senators seem to repeat very similar questions several times in these sections. What do you think this could reveal about what is important to them about the photo?
    2. It seems like the senators are concerned that the composite photo might be biased in some way. Recall from earlier that there are many ways in which something can be biased. Can you identify some types of bias that might be concerning them?

## 4.4. Part 3: Deepfakes

### Reading

In this section, we're going to look at *deepfakes*—videos, usually with human subjects, that have been generated or altered using computer-automated processes such as machine learning. Machine learning is a family of techniques by which computer programs learn to perform some task. Importantly, machine learning automates the process of figuring out how to perform the task. It commonly involves providing a program with a large dataset of examples,

called a training set, which the program uses to find patterns and build a model of how to perform the task on new data in the future. While generated and altered videos involving human subjects have existed for decades in the film industry, deepfakes are different because machine learning has made the process of creating them largely automated and accessible. The process requires no expertise in image or video editing, and can be run in just hours, with relatively common computer equipment.

Many different projects seem to be associated with deepfakes. However, deepfakes have the longest history in the academic community. Academic research related to deepfakes lies predominantly within the field of computer vision, a subfield of computer science often grounded in artificial intelligence that focuses on computer processing of digital images and videos.

An early landmark project was the Video Rewrite program, published in 1997, which modified existing video footage of a person speaking to depict that person mouthing the words contained in a different audio track. It was the first system to fully automate this kind of facial reanimation, and it did so using machine learning techniques to make connections between the sounds produced by a video's subject and the shape of their face.

More contemporary academic projects have focused on creating more realistic videos and on making techniques simpler, faster, and more accessible. The "Synthesizing Obama" program, published in 2017, modifies video footage of former president Barack Obama to depict him mouthing the words contained in a separate audio track. The researchers focused specifically on Obama because there exists a large amount of existing video footage of him that can be used as a training set. The project lists as a main research contribution its "photorealistic" technique for

synthesizing mouth shapes from audio. An online video demonstration can be found here: https://youtu.be/9Yq67CjDqvw.

The Face2Face program, published in 2016, modifies video footage of a person's face to depict them mimicking the facial expressions of another person in real time. The project lists as a main research contribution the first method for reenacting facial expressions in real time using a camera that does not capture depth, making it possible for the technique to be performed using common consumer cameras. An online video demonstration can be found here: https://youtu.be/ohmajJTcpNk. Another program, named "Everybody Dance Now," generates a video of one person's body mimicking the movements of another person, in a video. Check out the online video demonstration here: https://youtu.be/PCBTZh41Ris.

However, the term deepfakes originated from a very different community, around the end of 2017 from a Reddit user named "deepfakes." He, as well as others in the Reddit community r/deepfakes, shared deepfakes they created depicting one person's face in a video swapped with a different person's face; many videos involved celebrities' faces swapped onto the bodies of actresses in pornographic videos, while non-pornographic content included many videos with actor Nicolas Cage's face swapped into various movies. An example deepfake of Nicolas Cage's face swapped onto Harrison Ford's face in one of the *Indiana Jones* movies can be found here: https://youtu.be/v0zFR0ElRd4. We will not look at involuntary celebrity pornography, for obvious reasons. In February 2018, r/deepfakes was banned by Reddit for sharing involuntary pornography.

Other online communities remain, however, including Reddit communities that do not share pornography, opting rather for deepfakes depicting celebrities, politicians, and others in

non-pornographic scenarios. Also remaining are online communities that do continue to share pornography, and these are often sites associated with alt-right movements.

Many have expressed concerns about potential harms of deepfakes. Some worry about the use of deepfakes to manipulate democratic elections: for example, a video could be circulated depicting a politician saying something embarrassing or offensive right before an election. Some worry about threats to national security: for example, a video could be created of a country's leader claiming to have launched nuclear weapons, leaving governments very little time to evaluate the authenticity of the video and respond to such a serious claim. Some worry that government bodies or political campaigns might use fake videos to manipulate the American public, that bad actors might target children using fake videos of people they trust, and that celebrities and others are harmed when their faces are used to create fake pornographic videos.

Many different kinds of solutions have been proposed to address these harms. On the technological side, some researchers are working on digital forensics—methods and tools, often based on machine learning, that could help detect videos that are deepfakes. This approach is not well developed yet, and many are concerned that deepfake technologies will simply be adjusted to pass eventual digital forensics tests. A different approach on the technological side is verified cameras—cameras or camera programs that save information about a video at time of recording, in such a way that videos can be verified in the future as not deepfakes. While this method is theoretically great for verifying that a video taken using a verified camera is not a deepfake, it would not be able to determine if a video was a deepfake or not, if the video was not taken using a verified camera.

The primary solution that has been taken so far has been platform-driven censorship. For example, Reddit has shut down many deepfake-related pages for sharing involuntary

pornography; it is not the only website to ban certain kinds of deepfakes. However, a concern with this solution is that not all platforms may choose to censor, making censorship only temporarily effective because communities that create and share concerning deepfakes may simply move to platforms that do not censor deepfakes.

Legal solutions have also been proposed. In the U.S., certain laws already provide people with legal options in various scenarios. There are several avenues for suing creators of deepfakes if a subject is personally harmed in some way, including categories of harm such as emotional distress. However, as many deepfakes may be created anonymously and by people not in a different country, suing creators of deepfakes can get complicated. There are also avenues for suing platforms for allowing harmful deepfakes; however, it will likely be difficult to strike a balance that both prevents harm and does not reduce the benefits and rights of free speech, such as parody, too broadly. Finally, deepfake-specific laws are being considered, in attempts to deal with these issues. It remains to be seen whether significant laws will be passed, and what their effect will be.

In the meantime, other solutions like this learning module aim to promote awareness and media literacy in this topic. If people can learn to think critically when interacting with photos and videos, perhaps less harm will result from deepfakes.

**Questions**

1. Have you heard of deepfakes before? If so, how did you learn about them?
2. Make sure to take a look at the example deepfakes linked in the reading, if you haven't already. If this is your first time learning about deepfakes, what are your initial reactions?

If this isn't your first time learning about deepfakes, do you remember your initial reactions? Have your thoughts changed over time?

3. Think back to Reading 2 and Questions 2. How might deepfakes change the role that videos play in whether we believe the truthfulness of a claim?
4. Read Franklin Foer's piece, "The Era of Fake Video Begins": https://www.theatlantic.com/magazine/archive/2018/05/realitys-end/556877/. Foer writes that "It's been a little bit of a fluke, historically, that we're able to rely on videos as evidence that something really happened." Do you agree? Why or why not?

## 4.5. Part 4: Digital Media Literacy Activity

For our final activity, let's take a look at some digital media literacy activities. Our first activity is a training in digital media literacy created by GCF Global, a program of the non-profit organization Goodwill Industries. You can find it here: https://edu.gcfglobal.org/en/digital-media-literacy/. Read and complete parts 1, 2, 4, 5, 11, and 12. As you work through it, think about what aspects you find helpful or not helpful, and what you would change about it if you created your own digital media literacy training.

In addition, watch this one-minute-long video published by BuzzFeed: https://youtu.be/cQ54GDm1eL0. Finally, check out this game, developed by the American University Game Lab and JoLT program, which tests your ability to identify real news from fake news: http://factitious.augamestudio.com/#/. Complete at least one game—you can choose between easy, medium, or hard difficulty.

**Questions**

1. Did you feel that the training was helpful? Did you learn anything new? What parts of the training do you think are the most important?
2. In the era of deepfakes, is there anything you would add to the training? If so, how would you change it? If not, why not?
3. Is there anything else you would change about the training?
4. Do you think that trainings, videos, and games like these are important? Could they be effective in combatting misinformation and other harms that might be caused by deepfakes and other technologies? Should they be incorporated into classes in school?

# Chapter 5: Conclusion

In this thesis, I have begun building towards a critical understanding of deepfakes. I conducted a historical case study on a composite photograph in a 1950 election that raised questions about the role of photographs in daily life and in political campaigns; in doing so, I established the importance of thinking critically about the roles played by photos and videos in human activities, such as forming beliefs about the truthfulness of claims. I laid a foundation of knowledge concerning deepfakes, upon which knowledgeable inquiry and conversation can be built. And I developed a teaching module in order to help students think about photos, videos, and deepfakes using a critical lens.

My primary direction for future work is to make the research I have conducted accessible. I plan on making the teaching module publicly available online, and I plan on using the research I have conducted and the knowledge I have gained to continue revising and updating the Wikipedia article on deepfakes, in order to reach a wider audience.

I chose to research deepfakes for my thesis because I found them deeply concerning. There does seem to be a comfortable certainty that in videos we see what is real, and deepfakes threaten that certainty to its very core. But, perhaps, that certainty was never justified. There are plenty of other ways of manipulating videos to mislead that are common and easier to do: simply taking a video out of context or cutting off a sentence can drastically change what a video will mean to many people. Deepfakes or not, it’s time we act to develop a new digital media literacy. I hope that this project can contribute a step in the right direction.

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