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Machine Learning and the Social Studies

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When we use digital assistants to process our search queries, generate driving directions, or answer our voice commands, advanced technologies gather available data and use this information to perform tasks that require decision making and problem solving. These examples of machine learning have become commonplace in our everyday lives. Machine learning refers to computer algorithms that demonstrate some form of intelligence akin to human cognition—for example, differentiating images of planes and trains, or identifying hate speech in social media posts. Much of our day-to-day technology is powered by machine learning. Given its astounding acceleration, most people do not realize that they are continuously encountering machine learning all around them.

Nonetheless, these technological advances can have problematic consequences that create ethical issues.[1] Recently, we witnessed the beneficial and dangerous outcomes associated with machine learning in social media contexts. Machine learning can forecast and disrupt the spread of disinformation, but it also has been used to generate entirely false news stories (i.e., deep fakes) that are indistinguishable from real news.[2] The tools used to counter disinformation also allow viral content to spread through social networks. When we come across unexpected but engaging posts in our social media feeds, machine learning algorithms have learned about our interests and preferences and curated content to capture our attention and focus. The side effects are technological echo chambers that propel malicious content into the public sphere and target users who are susceptible to extremist views.

We have a responsibility in the social studies to discuss machine learning, including its benefits and potential misuses as societies increasingly delegate complex decisions that affect the lives of citizens to artificial intelligence systems. We can best develop student competencies by using powerful machine learning tools as part of our instruction and pulling the curtain back on the technology that drives the innovation. This approach to media literacy in the social studies includes digital media learning experiences that delve into both the efficiencies and flaws to critically scrutinize technologies that have public policy implications.

Newspaper Navigator

To integrate machine learning into the social studies classroom, students can consider how these innovations impact our ability to navigate digital collections, which are often limited not by the availability of digitized materials but rather by the ability to properly search them. Developments in machine learning have the capacity to unlock the ability to search over visual content, audio materials, webpages, and videos. As a case study, we discuss *Newspaper Navigator*, a project led by one of the authors in partnership with colleagues at the Library of Congress and the University of Washington to improve access to the visual content in 16+ million pages of digitized historic newspapers in *Chronicling America*.

Newspaper Navigator is a new free online tool for finding images and photos in the *Chronicling America* newspaper collection. The first goal of *Newspaper Navigator* was to use machine learning to extract photographs, illustrations, maps, comics, editorial cartoons, headlines, and advertisements from 16+ million pages of digitized historic newspapers. By extracting this visual content, along with captions, *Newspaper Navigator* enriches existing metadata for *Chronicling America*, allowing people to search more granularly than at the page level.

To train the machine learning model, *Newspaper Navigator* used thousands of crowdsourced annotations from the *Beyond Words* citizen history project,[3] which engaged the American public by asking volunteers to draw bounding boxes around the rich visual content in World War 1-era pages in *Chronicling America*.[4] By training a machine learning algorithm known as an object detection model to draw these bounding boxes, it became possible to automate this process across the entirety of *Chronicling America*. Figure 1 shows the visual content identified by this machine learning model on a sample page.

After running this process over all 16 million pages, the project team released the *Newspaper Navigator* dataset.[5] The dataset supports access via pre-packaged datasets of different visual content types

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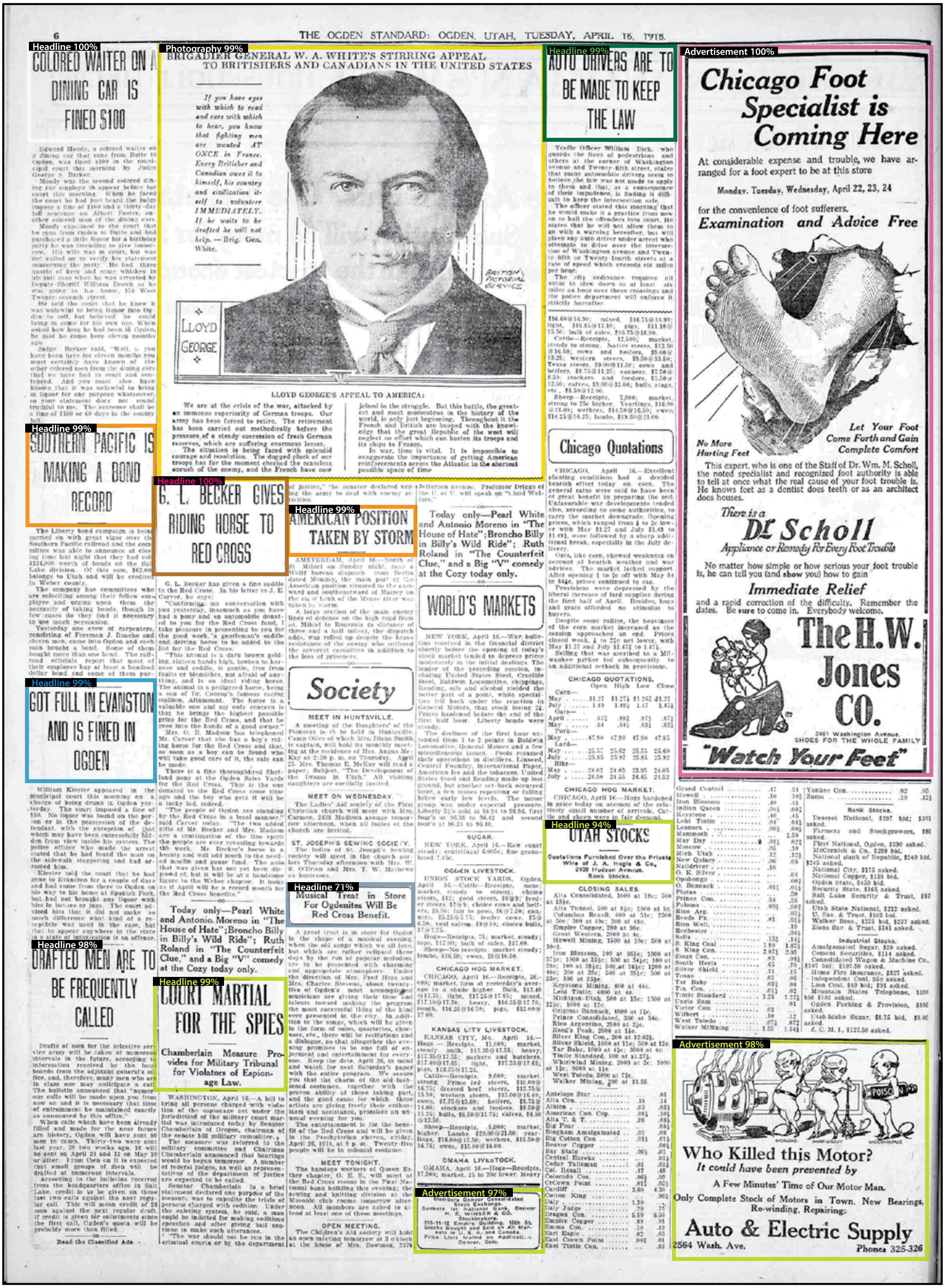
Figure 1. An example of visual content identified on a sample *Chronicling America* newspaper page by the *Newspaper Navigator* machine learning algorithm. The predicted category is shown in the top left of each predicted bounding box.


Headline 100%
Photography 99%
Headline 99%
Advertisement 100%
Headline 99%
Headline 100%
Headline 99%
Headline 99%
Headline 94%
Headline 71%
Headline 98%
Headline 99%
Advertisement 98%
Advertisement 97%

6 THE OGDEN STANDARD: OGDEN, UTAH, TUESDAY, APRIL 16, 1918.

BRIGADIER GENERAL W. A. WHITE'S STIRRING APPEAL TO BRITISHERS AND CANADIANS IN THE UNITED STATES

If you have eyes with which to read and ears with which to hear, you know that fighting men are wanted AT ONCE in France. Every Britisher and Canadian owes it to himself, his country and civilization itself to volunteer IMMEDIATELY. If he waits to be drafted he will not help. — Brig. Gen. White.

LLOYD GEORGE

BRITISH PICTORIAL SERVICE

LLOYD GEORGE'S APPEAL TO AMERICA:

We are at the crisis of the war, attacked by an immense superiority of German troops. Our army has been forced to retire. The retirement has been carried out methodically before the pressure of a steady succession of fresh German reserves, which are suffering enormous losses.

The situation is being faced with splendid courage and resolution. The dogged pluck of our troops has for the moment checked the ceaseless onrush of the enemy, and the French have now joined in the struggle. But this battle, the greatest and most momentous in the history of the world, is only just beginning. Throughout it the French and British are buoyed with the knowledge that the great Republic of the west will neglect no effort which can hasten its troops and its ships to France.

In war, time is vital. It is impossible to exaggerate the importance of getting American reinforcements across the Atlantic in the shortest possible space of time

COLORED WAITER ON A DINING CAR IS FINED $100

Edward Moody, a colored waiter on a dining car that runs from Butte to Ogden, was fined $100 in the municipal court this morning by Judge George S. Barker.

Moody was the second colored dining car employe to appear before the court this morning. When he faced the court he had just heard the judge impose a fine of $100 and a thirty-day jail sentence on Albert Foster, another colored man of the dining cars.

Moody explained to the court that he runs from Ogden to Butte and had purchased a little liquor for a birthday party he was intending to give tomorrow. His wife was in court, but was not called on to verify his statement concerning the party. He had three quarts of beer and some whiskey in his suit case when he was arrested by Deputy-Sheriff William Brown as he was going to his home, 134 West Twenty-seventh street.

He told the court that he knew it was unlawful to bring liquor into Ogden to sell, but believed he could bring in some for his own use. When asked how long he had been in Ogden, he said he came here eleven months ago.

Judge Barker said, "Well, if you have been here for eleven months you must certainly have known of the other colored men from the dining cars that we have had in court and sentenced. And you must also have known that it was unlawful to bring in liquor for any purpose whatsoever, so your statement does not sound truthful to me. The sentence shall be a fine of $100 or 60 days in the county jail.

SOUTHERN PACIFIC IS MAKING A BOND RECORD

The Liberty bond campaign is being carried on with great vigor over the Southern Pacific railroad and the committee was able to announce at closing time last night that they had sold $134,000 worth of bonds on the Salt Lake division. Of this sum, $62,000 belongs to Utah and will be credited to Weber county.

The company has committees who are selecting among their fellow employes and urging upon them the necessity of taking bonds, though in few cases do they find it necessary to use much persuasion.

Yesterday one crew of carpenters, consisting of Foreman J. Roache and eleven men, came into Ogden and each man bought a bond. Some of them bought more than one bond. The railroad officials report that most of their employes buy at least a hundred dollar bond and some of them pur-

GOT FULL IN EVANSTON AND IS FINED IN OGDEN

William Kiester appeared in the municipal court this morning on a charge of being drunk in Ogden yesterday. The court imposed a fine of $50. No liquor was found on the person or in the possession of the defendant, with the exception of that which may have been successfully hidden from view inside his system. The police officer who made the arrest stated that he had found the man on the sidewalk staggering and had arrested him.

Kiester told the court that he had gone to Evanston for a couple of days and had come from there to Ogden on his way to his home at Spanish Fork, but had not brought any liquor with him in bottles or jugs. The court advised him that it did not make so much difference what kind of a receptacle was used in the case, but that to appear anywhere in the state in a state of intoxication is an offense.

DRAFTED MEN ARE TO BE FREQUENTLY CALLED

Drafts of men for the selective service army will be taken at numerous intervals in the future, according to information received by the local boards from the adjutant general's office, and, therefore, many men who are in class one may anticipate a call. The bulletin announced that "numerous calls will be made upon you from now on and it is necessary that time of entrainment be maintained exactly as announced by this office."

When calls which have been already filled and made for the near future are history, Ogden will have sent 80 men to camp. Thirty-two were sent last year, 20 two weeks ago, 16 will be sent on April 24 and 12 on May 10 or after. From then on it is expected that small groups of men will be drafted at numerous intervals.

According to the bulletins received from the headquarters office in Salt Lake, credit is to be given on these last two calls against the next regular call. This will mean credit of 28 men against the next regular draft. If credit is given for enlistments since the first call, Ogden's quota will be probably more than filled.

Read the Classified Ads.

G. L. BECKER GIVES RIDING HORSE TO RED CROSS

G. L. Becker has given a fine saddle to the Red Cross. In his letter to J. E. Carver, he says:

"Confirming my conversation with you yesterday, inasmuch as you have had a pony and an automobile donated to you for the Red Cross fund, I take pleasure in presenting to you for the good work, a gentleman's saddle and driving horse to be added to the list for the Red Cross.

"This animal is a dark brown gelding, sixteen hands high, broken to harness and saddle, is gentle, free from faults or blemishes, not afraid of anything, and is an ideal riding horse. The animal is a pedigreed horse, being a son of Dr. Conroy's famous racing stallion, Altamount. The horse is a valuable one and my only concern is that he brings the highest possible price for the Red Cross, and that he goes into the hands of a good owner."

Mrs. O. B. Madson has telephoned Mr. Carver that she has a boy's riding horse for the Red Cross and that, as soon as a boy can be found who will take good care of it, the sale can be made.

There is a fine thoroughbred Shetland pony at the Ogden Sales Yards for the Red Cross. This is the one donated to the Red Cross some time ago and the boy who gets it will be a lucky lad, indeed.

"The people of Ogden are standing by the Red Cross in a loyal manner," said Carver today. "The two added gifts of Mr. Becker and Mrs. Madson are a continuation of the fine spirit the people are ever revealing towards the work. Mr. Becker's horse is a beauty and will add much to the needed muslin and gauze fund. The auto that was given has not yet been disposed of, but it will be at a handsome figure to the Weber chapter. It looks as if April will be a record month for the Red Cross benefits."

COURT MARTIAL FOR THE SPIES

Chamberlain Measure Provides for Military Tribunal for Violators of Espionage Law.

WASHINGTON, April 16.—A bill to bring all persons charged with violation of the espionage act under the jurisdiction of the military court martial was introduced today by Senator Chamberlain of Oregon, chairman of the senate bill military committee.

The measure was referred to the military committee and Chairman Chamberlain announced that hearings would be begun tomorrow. A number of federal judges, as well as representatives of the department of justice are expected to be called.

Senator Chamberlain in a brief statement declared one purpose of the measure was to expedite the trials of persons charged with sedition. Under the existing system, he said, a man could be indicted for making seditious speeches and after giving bail continue to make such utterances.

"The war should not be run in the criminal courts or by the department of justice," the senator declared urging the army to deal with enemy activities.

AMERICAN POSITION TAKEN BY STORM

AMSTERDAM, April 16.—North of St. Mihiel on Sunday night, says a Wolff bureau dispatch from Berlin dated Monday, the main part of the American position situated to the eastward and southeastward of Maizey on the right bank of the Meuse river was taken by storm.

A large section of the main enemy lines of defense on the high road from St. Mihiel to Rouvrois (a distance of three and a half miles), the dispatch adds, was rolled up despite the brave resistance of the enemy who suffered the severest casualties in addition to the loss of prisoners.

Society

MEET IN HUNTSVILLE.

A meeting of the Daughters' of the Pioneers is to be held in Huntsville. Camp Olive of which Mrs. Diana Smith is captain, will hold its monthly meeting at the residence of Mrs. Angus McKay at 2:30 p. m. on Thursday, April 25. Mrs. Thomas E. McKay will read a paper; Subject, "The Development of the Drama in Utah." All visiting daughters are cordially invited.

MEET ON WEDNESDAY.

The Ladies' Aid society of the First Christian church will meet with Mrs. Carmen, 2438 Madison avenue tomorrow afternoon, when all ladies of the church are invited.

ST. JOSEPH'S SEWING SOCIETY.

The ladies of St. Joseph's Sewing society will meet in the church parlors Thursday afternoon with Mrs. W. S. O'Brien and Mrs. T. W. Mathews as hostesses.

Musical Treat in Store For Ogdenites Will Be Red Cross Benefit.

A great treat is in store for Ogden in the shape of a musical evening, when the old songs which we all love, but which are rather eclipsed these days by the run of popular melodies, are to be presented with charming and appropriate atmosphere. Under the direction of Mrs. Fred Hess and Mrs. Charles Stevens, about twenty-five of Ogden's most accomplished musicians are giving their time and talents toward making the program the most successful thing of the kind ever presented in the city. In addition to the songs, which will be given in the form of solos, quartettes, choruses, etc., there will be recitations and a dialogue, so that altogether the evening promises to be one full of enjoyment and entertainment for everyone. Keep the date, April 26, in mind and watch for next Saturday's paper with the entire program. We assure you that the charm of the old-fashioned costumes, together with the proven ability of those taking part, and the good cause for which these artists are giving freely their enthusiasm and assistance, promises an unusual evening for you.

The entertainment is for the benefit of the Red Cross and will be given in the Presbyterian church, Friday, April 26, 1918, at 8 p. m. Twenty-five people will be in colonial costume.

MEET TONIGHT.

The bandage workers of Queen Esther chapter, O. E. S., will meet at the Red Cross rooms in the First National bank building this evening; the sewing and knitting division at the Masonic club rooms tomorrow afternoon. All members are asked to attend at least one of these meetings.

OPEN MEETING.

The Children's Aid society will hold an open meeting tomorrow at 3 o'clock at the home of Mrs. Bowman, 2576 Jefferson avenue. Professor Driggs of the U. of U. will speak on "Child Welfare."

WORLD'S MARKETS

NEW YORK, April 16.—War bulletins received in the financial district shortly before the opening of today's stock market tended to depress prices moderately in the initial dealings. The leader of the preceding session, including United States Steel, Crucible Steel, Baldwin Locomotive, shippings, Reading, oils and alcohol yielded the better part of a point, while specialties fell back under the reaction in General Motors, that stock losing 2¾. Prices hardened before the end of the first half hour. Liberty bonds were steady.

The declines of the first hour extended from 1 to 2 points in Baldwin Locomotive, General Motors and a few miscellaneous issues. Pools resumed their operations in distillers, Linseed, Central Foundry, International Paper, American Ice and the tobaccos. United States Steel and Reading made up lost ground, but another set-back occurred later, a few issues repeating or falling below early low levels. The motor group was under especial pressure. Liberty 3½'s sold at 98.54 to 98.56, first four's at 96.38 to 96.42 and second four's at 96.24 to 96.40.

SUGAR.

NEW YORK, April 16.—Raw sugar steady; centrifugal 6.005c; fine granulated 7.45c.

OGDEN LIVESTOCK.

UNION STOCK YARDS, Ogden, April 16.—Cattle—Receipts, none; market, steady to strong; choice steers, $12; good steers, $8@9; feeder steers, $7@9; choice cows and heifers, $9.50; fair to good, $6@7.50; canners, $5.25@5.75; feeder cows, $5@6.50; veal calves, $9@10; choice bulls, $7@7.75.

Hogs—Receipts, 75; market, steady; tops, $17.00; bulk of sales, $17.00.

Sheep—No receipts; market steady; lambs, $16.50; ewes, $9@16.50.

CHICAGO HOG MARKET.

CHICAGO, April 16.—Receipts, 26,000; market, firm at yesterday's average to a shade higher. Bulk, $17.40@17.75; light, $17.25@17.85; mixed, $17.10@17.70; heavy, $16.25@17.70; rough, $16.25@16.50; pigs, $13.00@17.00.

KANSAS CITY LIVESTOCK.

KANSAS CITY, Mo., April 16.—Hogs — Receipts, 11,000; market, steady; bulk, $17.35@17.55; heavy, $17.35@17.55; packers and butchers, $17.40@17.65; light, $17.35@17.65; pigs, $13.75@17.25.

Cattle—Receipts, 9,000; market, strong. Prime fed steers, $15.60@16.75; dressed beef steers, $13.75@15.50; western steers, $13.00@16.40; cows, $7.75@13.60; heifers, $8.75@14.00; stockers and feeders, $8.50@13.25; bulls, $8.50@11.75; calves, $8.50@13.50.

Sheep—Receipts, 5,000; market, higher. Lambs, $20.00@21.00; yearlings, $16.00@17.50; wethers, $15.50@16.75; ewes, $15.00@16.00.

OMAHA LIVESTOCK.

OMAHA, April 16.—Hogs—Receipts, 17,500; market, 15 to 20c lower. Heavy $16.60@16.90; mixed, $16.75@16.90; light, $16.85@17.10; pigs, $11.10@15.50; bulk of sales, $16.75@16.90.

Cattle—Receipts, 12,500; market, steady to strong. Native steers, $12.50@16.50; cows and heifers, $9.00@13.25; western steers, $9.50@13.50; Texas steers, $9.00@11.50; cows and heifers, $8.75@11.25; canners, $7.50@8.50; stockers and feeders, $7.50@12.50; calves, $9.00@13.00; bulls, stags, etc., $8.50@12.00.

Sheep—Receipts, 7,000; market, strong to 25c higher. Yearlings, $16.00@18.00; wethers, $14.50@16.50; ewes, $14.25@16.25; lambs, $19.50@21.00.

AUTO DRIVERS ARE TO BE MADE TO KEEP THE LAW

Traffic Officer William Dick, who guards the lives of pedestrians and others at the corner of Washington avenue and Twenty-fifth street, states that many automobile drivers seem to believe the law was not made to apply to them and that, as a consequence of their impudence, is finding it difficult to keep the intersection safe.

The officer stated this morning that he would make it a practice from now on to hail the offenders into court. He states that he will not allow them to go with a warning hereafter, but will place any auto driver under arrest who attempts to drive over the intersection of Washington avenue and Twenty-fifth or Twenty-fourth streets at a rate of speed which exceeds six miles per hour.

The city ordinance requires all autos to slow down to at least six miles an hour over these crossings and the police department will enforce it strictly hereafter.

Chicago Quotations

CHICAGO, April 16.—Excellent planting conditions had a decided bearish effect today on corn. The general rains were said to have been of great benefit in preparing the soil. Unfavorable war developments tended also, according to some authorities, to carry the market downgrade. Opening prices, which ranged from ⅛ to ⅞c lower with May $1.27 and July $1.49 to $1.49½, were followed by a sharp additional break, especially in the July delivery.

Oats, like corn, showed weakness on account of bearish weather and war advices. The market lacked support. After opening ⅛ to ⅞c off with May 84 to 84¼c, prices continued to sag.

Provisions were depressed by the liberal increase of lard supplies during the first half of April. Besides, hogs and grain afforded no stimulus to buyers.

Despite some rallies, the heaviness of the corn market increased as the session approached an end. Prices closed weak, ⅛ to 2½c net lower, with May $1.27 and July $1.47⅞ to 1.47¼.

Selling that was ascribed to a Milwaukee packer led subsequently to an additional setback in provisions.

CHICAGO QUOTATIONS.

	Open	High	Low	Close
Corn—				
May	$1.27	$1.27¼	$1.26⅞	$1.27
July	1.49	1.49½	1.47	1.47¼
Oats—				
April	.87⅞	.88½	.87½	.87½
May	.84	.84½	.83½	.83½
Pork—				
May	47.50	47.90	47.50	47.85
Lard—				
May	25.55	25.62	25.55	25.60
July	25.85	25.97	25.85	25.92
Ribs—				
May	24.62	24.65	23.95	24.05
July	24.50	24.55	24.45	24.52

CHICAGO HOG MARKET.

CHICAGO, April 16.—Hogs hardened in price today on account of the relatively small number of arrivals. Cattle and sheep were in fair demand.

UTAH STOCKS

Quotations Furnished Over the Private Wire of J. A. Hogle & Co., 2409 Hudson Avenue.

Bank Stocks.

CLOSING SALES.

Alta Consolidated, 1000 at 19c; 500 at 18½c.

Alta Tunnel, 500 at 8½c; 1000 at 8c.

Columbus Rexall, 400 at 51c; 2500 at 50c; 300 at 49c; 200 at 48c.

Empire Copper, 200 at 90c.

Great Western, 2000 at 4c.

Howell Mining, 1500 at 10c; 500 at 10¼c.

Iron Blossom, 100 at 36½c; 1000 at 37½c; 1000 at 35½c; 500 at 34½c; 100 at 38c; 100 at 38½c; 500 at 36½c; 1200 at 40c; 300 at 35c; 500 at 39½c; 500 at 33c; 500 at 33½c.

Keystone Mining, 400 at 44c.

Lehi Tintic, 4000 at 4c.

Michigan-Utah, 500 at 12c; 1500 at 12½c; 1000 at 12c.

Original Bannack, 4000 at 11c.

Prince Consolidated, 300 at 54c.

Rico Argentine, 2500 at 3½c.

Reed's Peak, 2000 at 1¼c.

Silver King Con., 200 at $2.02½.

Silver Shield, 1000 at 11c; 500 at 12c.

Tar Baby, 1000 at 4½c; 3000 at 4c.

Tintic Standard, 100 at $1.27½.

Whirlwind Mining, 2000 at 2c; 1000 at 1½c; 9000 at 1¼c.

West Toledo, 3000 at 7½c.

Walker Mining, 200 at $1.55.

Antelope Star	...	.01
Alta Con.	.18	.14
Albion	.03	.03½
American Con. Cop.	.08½	.10½
Alta T. & T.	.08	.08½
Big Four	...	.08½
Bingham Amalgamated	.07	.08
Big Cotton Con	.01½	.01½
Beaver Copper	...	.00½
Bay State	.00½	.01
Central Eureka	...	.01½
Cedar Talisman	.01	.01½
Col. Rexall	.47	.48
Colorado Con.	.06½	.09
CrCown Point	.01½	.02½
Cardiff	3.60	4.30
Cotton King	...	.00½
Daly	1.30	...
Daly Judge	.70	.75
Dragon Con.	5.50	6.50
Empire Copper	.89	.91
Emma Con.	.10	.19
Earl Eagle	.02	.03
East Crown Point	.00½	.01
East Tintic Con.	...	.03
Grand Central	.47	.54
Howell	.10	.10½
Iron Blossom	.40	.41
Indian Queen	.00½	.00¾
Keystone	.40	.45
Lehi Tintic	.04	.04½
Leonora	.00½	.00½
Mammoth	...	1.50
May Day	.01½	.02¾
Moscow	.05	.10
Mich. Utah	.12	.12½
New Quincy	.06	.08
Naildriver	.10	...
O. K. Silver	...	.04
Opohongo	...	.00½
O. Bannack	.01½	.01½
Plutus	...	.30
Prince Con.	.54	.55
Paloma	.00½	.00¾
Rico Arg.	...	.03½
Reeds Pk.	.01	.01½
Rico Well.	...	.18
Rochester	...	.04½
Selia	.13½	.14½
S. King Coal	1.80	1.87½
S. King Con.	2.07½	2.05
Sioux Con.	.03	.04½
South Hecla	.65	.70
Silver Shield	.11	.15
Texan	.01	.06
Tar Baby	.03½	.04
Tin. Con.	.01½	.02
Tintic Standard	1.25	1.27½
Uncle Sam	...	.01
Victor Con.	.03	...
Wilbert	.10	.12
West Toledo	.07½	.07¾
Walker MiMning	1.55	1.54½
Yankee Con.	.02	.05
Zuma	.10	.12½

Bank Stocks.

Deseret National, $297 bid; $301 asked.

Farmers and Stockgrowers, $80 asked.

First National, Ogden, $290 asked.

McCornick & Co., $250 bid.

National Bank of Republic, $240 bid, $245 asked.

National City, $175 asked.

National Copper, $135 bid.

Ogden State, $450 bid.

Security State, $165 asked.

Salt Lake Security & Trust, $97 asked.

Utah State National, $212 asked.

U. Sav. & Trust, $103 bid.

Walker Bros., $225 bid, $237 asked.

Zions Sav. & Trust, $341 asked.

Industrial Stocks.

Amalgamated Sugar, $20 asked.

Cement Securities, $114 asked.

Consolidated Wagon & Machine Co., $107 bid; $107.50 asked.

Home Fire Insurance, $327 asked.

Independent Coal, 95c asked.

Lion Coal, $89 bid; $91 asked.

Mountain States Telephone, $100 bid $102 asked.

Ogden Packing & Provision, $100 asked.

Utah-Idaho Sugar, $8.75 bid, $9.00 asked.

Z. C. M. I., $127.50 asked.

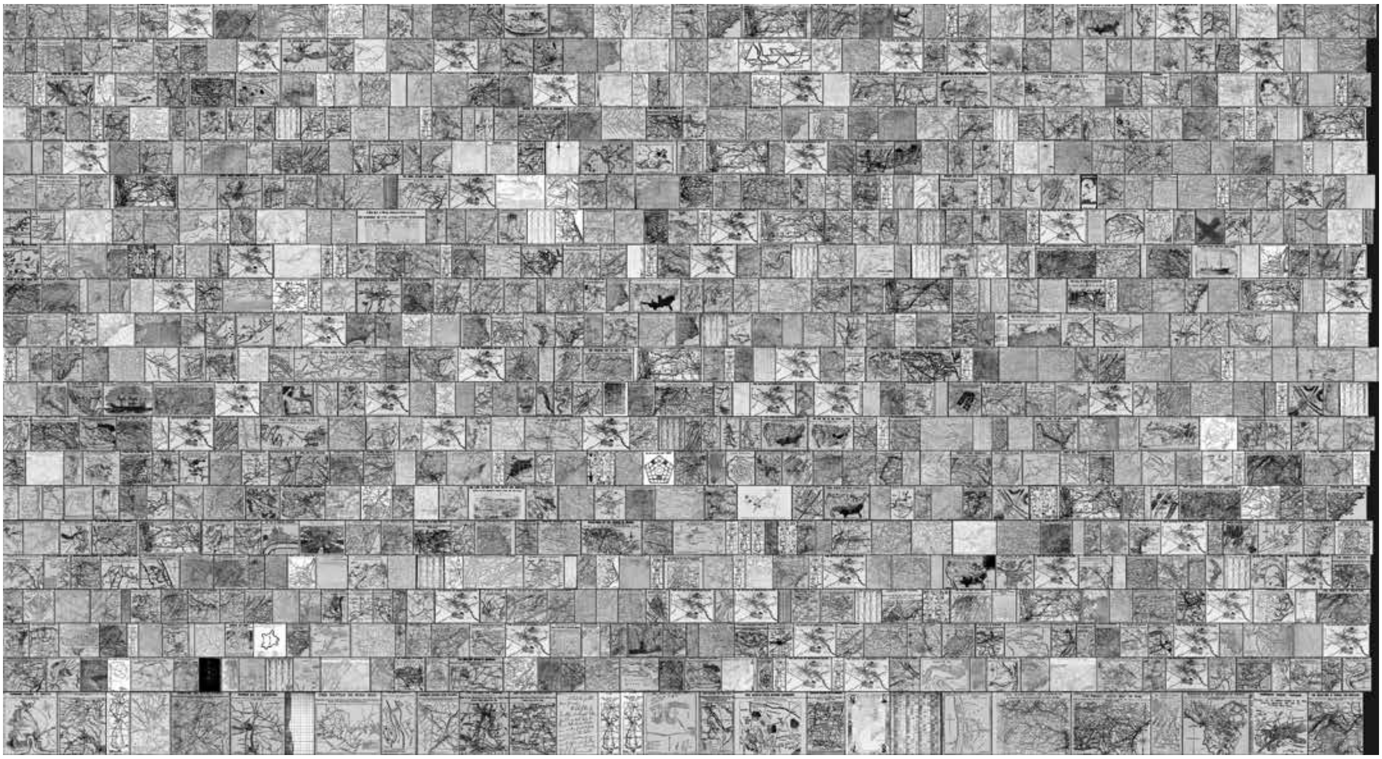


Figure 2. A visualization of maps from the Civil War identified within the *Newspaper Navigator* dataset.

MACHINE LEARNING *from page 88*

separated by year, enabling the public to download and explore maps of the Civil War (as visualized in Figure 2) or editorial cartoons from World War 1. These pre-packaged datasets make it possible to explore many of the historic events and topics described in the *Chronicling America* topic pages at a larger scale.[6] These topic pages are already well-utilized among social studies teachers, and the *Newspaper Navigator* pre-packaged datasets can be used in tandem. The full dataset is in the public domain, making it suitable for all potential re-uses in the classroom.

With the *Newspaper Navigator* dataset constructed, the second goal of *Newspaper Navigator* was to reimagine how to search over the extracted photographs in the dataset. This step resulted in the *Newspaper Navigator* application for searching 1.5 million photographs published between 1900 and 1963.[7] In addition to supporting standard keyword search and filtering capabilities, the search application empowers visitors to train a machine learning algorithm to search photos by visual similarity. Figure 3 illustrates how, based on user-selected examples of what the machine learning algorithm should and should not search for, the search application learns to retrieve desired types of photographs.

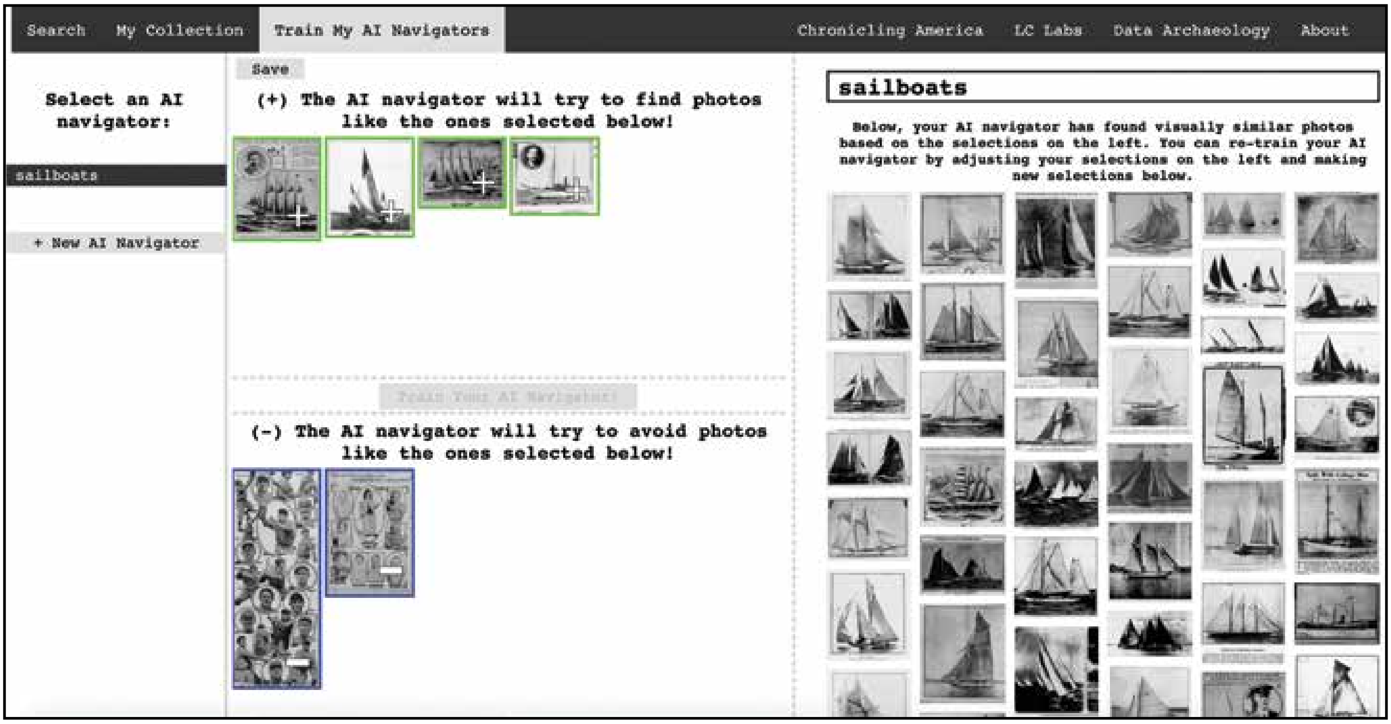
There are many applications for use in the classroom.[8] In social studies, this method of search offers students an opportunity to look at an event from multiple perspectives and unlock topics as far-ranging as emerging fashion trends or historic architectural styles. These user-defined content types can be as diverse as photographs of baseball players or sailboats or oval-shaped portraits. Students may trace the history of a topic over time or explore geographic differences in perspectives about an event. As they search for similar images, they may create a collection, examine the images for goodness of fit, and "retrain" the machine learning tool to improve its search performance. When the search process is complete, students may save the collection and have a URL generated to access it again or share with others. These projects transform how students engage with historic sources and digital collections and provide a formative evaluation of students' historical thinking and visual literacy skills.

Other Machine Learning Projects for Social Studies Teachers

Innovative applications of machine learning to digital collections are readily available for use in the social studies curriculum.[9] Some of our favorites are as follows:

- The Yale Digital Humanities Lab's PixPlot interface uses machine learning to explore 27,000 19th-century photographs.[10] Students may use the interface for visual analysis by examining clustered photos that share similar attributes (e.g., historical time period or content).

- Brian Foo's Citizen DJ project provides a freely accessible tool for exploring historic audio clips and moving images from the Library of Congress's collections.[11] Using



(+) The AI navigator will try to find photos like the ones selected below!

(-) The AI navigator will try to avoid photos like the ones selected below!

Below, your AI navigator has found visually similar photos based on the selections on the left. You can re-train your AI navigator by adjusting your selections on the left and making new selections below.

Figure 3. A screenshot of the *Newspaper Navigator* search application showing how a visitor trains an AI navigator to retrieve photographs of sailboats.

machine learning to generate samples, students may remix the recordings and create new music while exploring the historical context of the sounds. The materials include recordings of speeches, interviews, vaudeville acts, and other audio content.

- The "Dig That Lick" project navigates large databases of jazz solo recordings[12] and analyzes melodic patterns. Exploration of these musical patterns reveals how music is transmitted over time, and students can identify how music in the past has influenced other musicians across eras.

- The Civil War Photo Sleuth project uses artificial intelligence to identify photographs of unknown Civil War soldiers.[13] Teachers may use the interface to engage students in historical thinking skill development, using close inspection to corroborate matches.

- Google Arts & Culture Art Palette and MoMA's interactive archive of past exhibitions allow users to explore art with machine learning. Students may study color palettes in artwork and explore historical linkages across time.[14] They may also use the Google Art Selfie app to take a photo of themselves and have it compared with a vast archive of artwork to discover portraits that match their face and likeness.

Machine Learning and Algorithmic Bias

Machine learning is already radically changing how we interact with digital collections. With these dramatic changes, we must also be aware of the ways in which machine learning can be harmful. Because most machine learning algorithms are trained on data labeled by people, these algorithms perpetuate marginalization by amplifying bias in the human-labeled data. This phenomenon is often called "algorithmic bias." Algorithmic bias can be found in a wide range of deployed machine learning algorithms. For example, machine learning algorithms trained on text scraped from the Internet can learn to generate racist, sexist, and violent language. We must therefore be aware of how algorithmic bias affects our ability to search over cultural heritage collections when machine learning is used in the discovery process.[15]

To introduce students to algorithmic bias and explore how it affects the classification of information that may be used for decision making, students might experiment with Google's Teachable Machine Tool and try to build a classifier that distinguishes between cats and dogs when they are unknowingly provided with a biased dataset. When the classifier works better on cats than dogs, students have the opportunity to retrain their classifiers with their own new datasets.[16] Once they understand problems that can affect the accuracy of decision making with machine learning, students may discuss the potential social effects that occur when algorithms amplify biases and foster discrimination based on faulty assumptions by the human programmers who design the technology. Secondary students may explore proposed legislation for algorithmic accountability or draft an algorithmic bill of rights to protect citizens.[17]

From algorithms that perform better on English than non-English languages to image recognition algorithms that perform poorly on images of people of color, the impacts of machine learning as applied to digital collections can potentially erase entire communities. Therefore, it is critical that students are educated about algorithmic bias and the harmful effects of machine learning whenever these tools are used in the classroom.

Conclusion

In the coming years, machine learning will continue to shape how we navigate and access digital collections across different media, from documents to photos, audio, and webpages. In addition to improving metadata for collections, machine learning offers the ability to re-imagine how we perform searches and navigate materials, which present manifold opportunities in the classroom. With these exciting new methods of search comes the responsibility of understanding and teaching about the ways in which machine learning can also distort our understanding of our diverse cultural heritage. Social studies educators must not only promote an awareness of machine learning but must also address the broader media literacy issues that explicitly focus on the ways that machine learning can amplify inequality, racism, and injustice.

Notes

[1] See John Naughton, "From Viral Conspiracies to Exam Fiascos, Algorithms Come With Serious Side Effects," *The Guardian* (September 6, 2020), www.theguardian.com/technology/2020/sep/06/from-viral-conspiracies-to-exam-fiascos-algorithms-come-with-serious-side-effects

[2] See John Villasenor, "How to Deal with AI-enabled Disinformation," Brookings, (November 23, 2020), www.brookings.edu/research/how-to-deal-with-ai-enabled-disinformation/

[3] Learn more about *Beyond Words* here: https://labs.loc.gov/work/experiments/beyond-words/.

[4] For more on crowdsourcing in social studies, see Ilene R. Berson and Michael J. Berson, "Crowdsourcing the Social Studies," *Social Education* 83, no. 2 (March/April 2019): 103–107.

[5] You can access the dataset at https://news-navigator.labs.loc.gov. You can read more about the dataset construction at https://dl.acm.org/doi/10.1145/3340531.3412767.

[6] Topic pages can be found at www.loc.gov/rr/news/topics/index.html.

[7] The search application can be found at https://news-navigator.labs.loc.gov/search. An example of using the search function for the topic suffragist is discussed in Stephen Wesson, "Encouraging Student Exploration of Political Symbolism in Suffrage Cartoons," *Social Education* 84, no. 6 (November–December 2020): 384-386.

[8] The podcast can be found at https://theprimarysourcepodcast.podbean.com/e/s1e3-the-newspaper-navigator-search-app-an-educators-view/.

[9] A number of compelling examples of machine learning projects at cultural institutions are detailed in Ryan Cordell, "Machine Learning + Libraries," 2020, https://labs.loc.gov/static/labs/work/reports/Cordell-LOC-ML-report.pdf?loclr= blogsig.

[10] Yale Digital Humanities Lab, "PixPlot: Visualizing Image Fields," https://s3-us-west-2.amazonaws.com/lab-apps/pix-plot/index.html?utm_source=dancohen & utm_medium=email.

[11] "Designing for the (Citizen) | The Signal," webpage, https://blogs.loc.gov/thesignal/2020/09/designing-for-the-citizen-dj/. The interface can be found here: https://citizen-dj.labs.loc.gov/.

[12] "Dig That Lick – Pattern Search | Search," https://dig-that-lick.hfm-weimar.de/pattern_search/

[13] "Civil War Photo Sleuth," www.civilwarphotosleuth.com/; see also Vikram Mohanty et al., "Photo Sleuth: Combining Human Expertise and Face Recognition to Identify Historical Portraits," in *Proceedings of the 24th International Conference on Intelligent User Interfaces*, IUI '19 (New York, N.Y., USA: Association for Computing Machinery, 2019), 547–557, https://doi.org/10.1145/3301275.3302301.

[14] Art Palette uses machine learning to find artworks based on a chosen color palette. See https://artsexperiments.withgoogle.com/artpalette/.

[15] To learn more about these phenomena in the context of *Newspaper Navigator*, see Benjamin Lee, "Compounded Mediation: A Data Archaeology of the Newspaper Navigator Dataset" (September 1, 2020), https://hcommons.org/deposits/item/hc:32415/. For more on these effects in the context of libraries more generally, we recommend Thomas Padilla, "Responsible Operations: Data Science, Machine Learning, and AI in Libraries," OCLC, August 26, 2020, www.oclc.org/research/publications/2019/oclcresearch-responsible-operations-data-science-machine-learning-ai.html.

[16] MIT Media Lab has designed a curriculum for middle school students to teach the ethics of artificial intelligence. See https://docs.google.com/document/d/1e9wx9oBg7CR0s5O7YnYHVmX7H7pnlTfoDxNdrSGkp60/view

[17] Sens. Cory Booker (D-NJ) and Ron Wyden (D-OR) proposed the Algorithmic Accountability Act of 2019 that would require companies to audit their algorithms for bias and discrimination. See www.wyden.senate.gov/imo/media/doc/Algorithmic%20Accountability%20Act%20of%202019%20Bill%20Text.pdf

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