CS 7637 - KBAI: Homework 2

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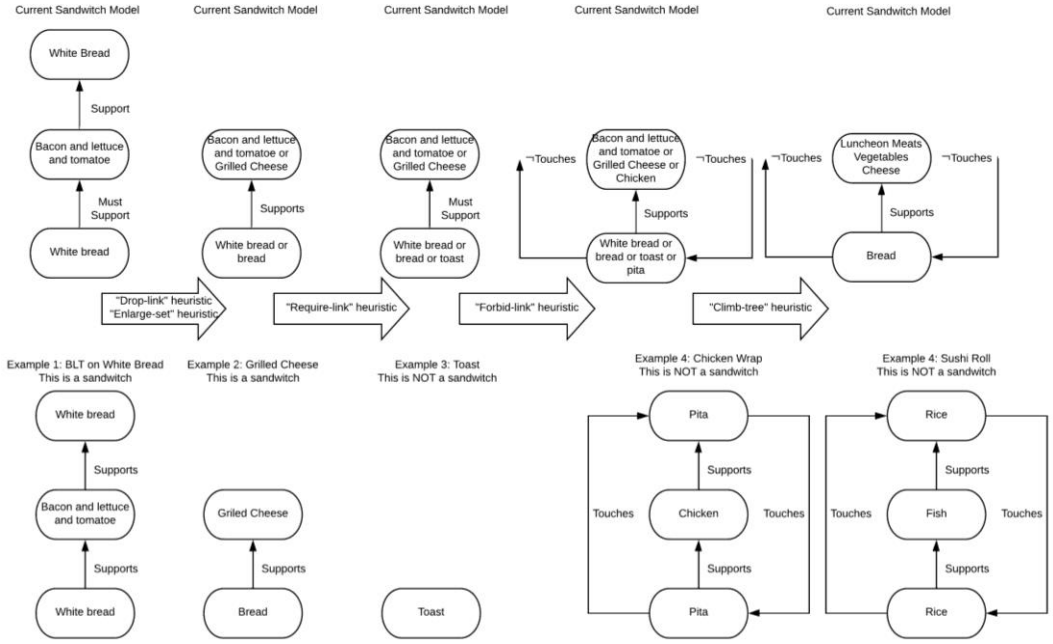
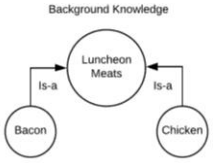
Question 1: What is a sandwich?

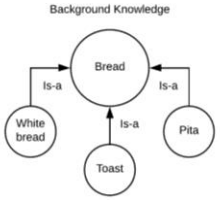
What is considered a sandwich?

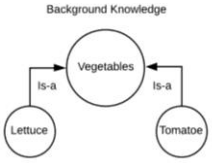
BLT on white bread	Yes	ice cream sandwich	Yes	Klondike bar	No
Hamburger	No	grilled cheese	Yes	egg & cheese biscuit	Yes
turkey and swiss on potato roll	Yes	turkey hero	No	buttered biscuit	No
meatball sub	Yes	ice cream taco	No	Gyro	Yes
tuna salad on brioche	Yes	vada pav	No	sushi rolls	No
chicken wrap	No	Toast	No	patty melt	Yes
chip butty	Yes	toaster strudel	No	Calzone	No
Burrito	No	veggie burger	No	sloppy joe	Yes

Incremental Concept Learning Sandwich Model









Items such an ice cream sandwich or hamburger would change the model quite interestingly. In the case of the ice cream sandwich, the “sandwich”-ness is implied in the name but the components are completely different. The bread is a sort of biscuit, the condiment is an ice cream and the whole thing must be cold or it decompositions if it is warmed up. A hamburger however, has all the properties of a BLT, including bread supports, lettuce, tomato, cheese and some meat. The meat however, completely changes the definition of the food from a sandwich to a burger, simply due to the burger patty.

Classification Approach

The following questions have been selected for the classification approach to defining a sandwich.

Has supporting bread slice?	Yes
Has meat/vegetable/cheese condiments?	Yes
Has top and bottom bread touching?	No
Are condiments on top of support bread slice?	Yes
Are supports made of a type of bread?	Yes
Is it hot to the touch?	Maybe

	Hamburger	Klondike	Toast	Burrito	BLT	Toaster Strudel
Support Bread	Yes	No	Yes	Yes	Yes	Yes
Condiments	Yes	No	No	Yes	Yes	No
Bread Touch	No	No	No	Yes	No	Yes
Condiments on top	Yes	Maybe	No	Maybe	Yes	Maybe
Supports are bread	Yes	No	Yes	Yes	Yes	Yes
Hot to the touch	Yes	No	Yes	Yes	Maybe	Yes

From the concept-learning approach, a hot dog is not a sandwich. Specifically, the bread support are touching on one side of a hot dog bun and the hot dog sausage is not a member of the luncheon meats background knowledge.

For the classification approach, a hot dog, also, is not a sandwich. For the same reasons as with the concept-learning approach, having the top and bottom support bread touching classifies the hot dog as not a sandwich.

For case based reasoning, the hot dog is closest to a calzone. The calzone is a bread pocket to hold a variety of condiments including meat, cheeses and vegetables. The hot dog also creates a sort of pocket at the touching of top and bottom breads which allows liquid condiments (i.e. mustard, ketchup) to be contained as a pocket-like feature.

Conclusion

In conclusion, all methods point to the fact that a hot dog is not a sandwich. Most interestingly, the connection between the top and bottom slices of the bread is the defining feature which separates the hot dog from other sandwiches. Not the contents or the ingredients of the food but the touching of the supporting bread slices is what makes a hot dog, a hot dog.

In retrospect, it is interesting to notice that as part of human cognition, we intuitively know what a hot dog is, but if one is asked to name the difference between a hot dog and a sandwich, I would venture very few human agents would pick the touching of the bread slices as the defining feature.

Question 2: “I never said Amy planted that seed.”

In order to make sense of the sentence, an AI agent can use Thematic Role frames to interpret the meaning. More specifically, one can define the Agent doing the speaking, the time frame of the action, the co-agent and the co action and the thematic object of the sentence. The resulting frame should look as the one illustrated below.

Thematic Role
- Agent: I
- Time: never
- Verb: speak
- Coagent: Amy

Coaction: plant Thematic Object: seed

In order to further interpret meaning from the sentence, further background knowledge is required. For example, the verb “said” or the primitive “speak” can have many definitions which may change the meaning of the sentence.

Definition (Say, 2019)	Frame Representation
to utter or pronounce; speak:	Say 1 Agent: Sentence:
to state as an opinion or judgment:	Say 2 Agent: Opinion: Subject:
to be certain, precise, or assured about; determine:	Say 3 Agent: Assertion: Assurance:
to recite or repeat:	Say 4 Agent: Prose:
to report or allege; maintain:	Say 5 Agent: Allegation: Subject:

In the meaning of the sentence, interpreting the word “said” as Say1, the main subject is “I” with the sentence that is being spoken as “… Amy planted that seed”. However, if interpreting the word “said” as defined by Say 5, then the main subject become Amy as the Agent is alleging that “Amy” performed a specific action. Thus, considering the background knowledge of the word “Say” the AI can further evaluate the sentence for its meaning. By knowing more about each comprised word, the AI can eliminate certain possibilities of meaning from its understanding of the sentence. For example, if the Agent “I” has no relationships

or connections with Amy, then there are no assertions or opinions that can be made about whether the Agent knows about Amy's actions, thus Say1 would become the most likely definition of "say".

Additionally, the background knowledge of the word "plant" would also help determine the literal or figurative meaning of "planting a seed".

Definition (Plant, 2019)	Frame Representation
To put or set in the ground for growth	Plant 1 Agent: Plant:
To furnish or stock with plants	Plant 2 Agent: Area:
To establish or implant (ideas or doctrines)	Plant 3 Agent: Idea: Subject:
To deposit in a river or lake.	Plant 5 Agent: Destination:

Similar to the way an AI agent would determine the meaning of "said" based on background knowledge, similarly the word "plant" would require further deduction to grasp full understanding. Depending on whether the seed was planted into the ground or into the mind, would indicate whether the see was physically real or only an idea. The vice versa would also be true; knowing whether the seed was real or metaphorical would give clue to whether the planting was of the mind or in the ground.

Question 3: Toronto Declaration

Preamble

The Preamble to the Toronto Declaration summarizes the goal of the Declaration. In simple terms, the protection of human rights and anti-discrimination due to machine learning and Artificial-Intelligence bias. The concert of the authors is

that certain groups of people may be discriminated against with the backing of AI and Machine Learning as statistical proof for people to discriminate. The Doctrine calls out for a systemic application of ethics and morals in order to remove such possible biases from AI algorithms in order to provide a fair chance to any and all peoples that may benefit from the technology. Most importantly, the authors call out for reaffirming and enforcing the current laws and standard of human rights across all systems that use Artificial Intelligence and Machine Learning algorithms to make decisions or suggestions. (Bacciarelli, 2018)

Using The Framework

In this section, the authors specify that any persons should be able to obtain effective remedy if their rights have been violated. Experts should have the right to discuss, critique, and advise on the use and utilization of such technologies. The governments, at both federal and state levels, should implement programs and be responsible for the promotion of human rights and effective use of Artificial intelligence technologies in ethical ways, so as not to discriminate against any person or persons. (Bacciarelli, 2018)

Duties of States

States are charged with the duty to promote, protect, and fulfill human rights. Additionally states are collectively charged with implementing the system with which machine learning is evaluated and analyzed for possible bias or discrimination – specifically against marginalized groups which may be most vulnerable to discrimination. More specifically, states are charged with identifying risks, ensuring transparency and accountability, enforcing oversight, promoting equality, and holding accountable any private sector actor which may violate any of these laws. (Bacciarelli, 2018)

Responsibilities of Private Sector Actors

Private Sector Actors are responsible for identifying any possible discrimination in an AI system and take effective action in remedying or prohibiting such discrimination. Additionally, the private sector actor must be transparent about any and all efforts in identifying, mitigating, and preventing any biases in machine learning or artificial intelligence systems being used. (Bacciarelli, 2018)

Right to an Effective Remedy

Rights to remedy are rights outlines by the authors that individuals possess and that any developer of an AI system must implement in order to provide prompt and effective remedies to any violations, as well as holding the responsible parties accountable. More specifically, any system utilizing artificial intelligence must provide means of reparations including but not limited to compensation, sanctions, and guarantees of non-repetition. (Bacciarelli, 2018)

Trade-offs

The largest trade-off being made under the Declaration is that of pure data against social norms. Where pure statistical data may point to a very specific claim about a certain sub-group of a population, society is forced to ignore and disregard any such claim so as to avoid discrimination against such a population of people's in order to maintain equal right for everyone. On the other hand, such checks and balances also ensure anyone who may try to artificially set the weights to an unfavorable side for a certain group of peoples would not be successful under a proper implementation under the Doctrine. The Doctrine serves a double-edged sword, providing protection while stalling innovation and progress in technological advancement.

What innovations may be lost?

As mentioned earlier, such a Declaration could possibly stall technological innovation. For example, certain genetic diseases affect exclusively certain subgroups. The algorithms that may evaluate data to point to a group such as this may be scrapped in the name of fairness and anti-discrimination, stalling medical treatment development.

What risks if declaration is discarded?

If the Declaration is discarded, the risk that some malignant code may tip the scales in favor of one group or another is extremely high. Since the code behind algorithms is complex and is usually hidden from the groups affected, such a scenario can be easily imagined. As an example, in law enforcement or financial gains, certain members of the public that hold the keys to the algorithm's core may sway the decision-making factors of an AI agent to a favorable side.

Your opinion on the declaration

I believe that the Declaration is a good beginning to the philosophical discussion on the implications of integrating AI and Machine Learning further into the daily life of society. It is imperative that members of the public, at least, understand what technologies may be influencing their decisions and have a chance to affect the use of such technologies. One aspect that is of concern is trust of the expert. Due to the complex nature of the technologies at hand, trust as a concept is not addressed. Most members of the public trust experts on their opinions, and this may lead to a bias of people to elect certain members of the public as representatives of public opinion, leading to the keys to AI power being in the hands of the few again. Atomic energy technology is also complex, but is only in effect during desperate times. Artificial Intelligence, on the other hand, is on track to be woven into every aspect of life for almost every citizen on the planet, leading to a far reaching and complex technology that is in constant danger of being tampered with by "experts".

Question 4: Positive and Negative AI Portrayal in Mass-Market Articles

Summary of Positive AI article (McCormick)

In this CNN article the company McCormick, famous for its line of different spices, is using Artificial Intelligence to develop possible new spices. Using data on raw ingredients, seasoning formulas, trends, and consumer tests, the Artificial Intelligence is able to produce new ingredient suggestions. The article alludes to the fact that this use is one of many taking shape in the food industry which is revolutionizing food pairing, menu creation, and taste prediction use in advancing business scope. (Metz, 2019)

Describe AI Portrayal in Positive Article

In this article, AI is portrayed in a very positive light. The AI is a suggestive helper which uses multiple data sources I order to provide a possible solution to a problem. The AI is not used for final product launches, considering the any AI suggestion is heavily scrutinized, tested, and refined before making it to the consumer. As such, the AI is simply an idea generator. The McCormick company

does not seem to spend any effort in communicating its AI-based strategy with the customer, relying on AI only to help internally within the company.

Evaluate Positive Article

The AI that is assisting McCormick engineers is fairly portrayed. It uses data analysis, feedback, forecasting and ingredient lists in order to learn about possible uses of raw ingredients, and then generate new suggestions based on past experiences. Instead of simply producing a result based on a query about the data, or defining a prediction about possible future data (as machine learning may do), this AI appears to invoke some form of creativity, allowing new recipes to be created.

Summary of Negative Article (Law)

In this article, the author introduces the possibility of Artificial Intelligence influencing the criminal justice system. Namely, the author points to a case which under the influence of statistically calculated risk assessment caused a criminal to receive a long sentence, without having the mechanics of the risk-assessment tool being discussed. The author concludes that with the introduction of Machine Learning and Artificial Intelligence where decision abstraction is guaranteed and a point-to-point logical decision making process cannot be explained, the criminal justice system will stand at a cross-road. Either all AI must be dismissed from courts, or the justice system will have to reform to trust any and all Artificial Intelligence results without ever fully understanding how the technology arrived at the answer that it did. (Tashea, 2018)

Describe AI portrayal in Negative Article

In this article, AI is portrayed as extremely dangerous. As an example, Neural Nets were presented as a technology which cannot be systematically explained even by experts. The only things that can be testified to are the inputs and the outputs, conceding that the AI itself makes connections and logical pathways that are not controlled by any human agent. This, being the basis of allegedly extreme danger to the criminal justice system, since no hard evidence of decision making can be inferred from a system which cannot be explained step-by-step even by an expert. As such, AI and machine learning, especially in defendant risk assessment may prove to inadvertently effect the bias towards a specific person without

explanation. This assertion opens the doors to philosophical discussion on discrimination, ethics, and weights on the decision making process of AI that may not be explainable in court and thus sway the decision of the judge.

Evaluate Negative Article

This article somewhat unfairly expresses concern over AI. Although the concern is legitimate, the author uses statistical risk assessment (not AI) and one example of Neural Networks to paint all of AI with a broad negative brush. Although it may prove to be true, that AI is inappropriate for the current day justice system, the arguments presented do not point to any specific AI feature, nor provide any solutions to remedy the situation. A simple take it or leave it decision to conclude the article is not constructive towards the discussion on the benefits of AI and is detrimental to the progress of such technologies. The author should have abstracted away from simple statistical modeling techniques and focused more on the ethics behind AI discrimination which may influence the justice system to focus on certain minority groups in bias. Overall, the author does not do a good job convincing the reader of the dangers of AI in this article.

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