

Homework 2(Summer 2020)

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1 QUESTION 1

Definition of Sandwich : “Two separate layers of bread with meat, cheese, or some sort of filling between the two layers of bread”. I started with simple definition of sandwich here and based on my understanding and experience, classified the items given in 2 categories as positives and negative cases :

A).

Food Item is sandwich?	
Positives	BLT on White Bread ; Hamburger ; Turkey and Swiss on potato Roll; Meatball sub; Tuna salad on brioche; Chip Butty , Grilled Cheese; Turkey Hero; Vada Pav; Veggie Burger ;Patty Melt ; Slopy Joe; Grilled Cheese
Negatives	Chicken Wrap ; Burrito; Ice Cream Sandwich; Ice Cream Taco; Toast ; Cheese Quesadilla; Toaster Strudel; Veggie Burger; Klondike Bar; Egg & Cheese Biscuit; Buttered Biscuit;Gyro; Sushi Rolls; Calzone; Sloppy Joe

Figure 1—Sandwich Items Classification

B). Model Illustrations using Incremental Concept Learning:

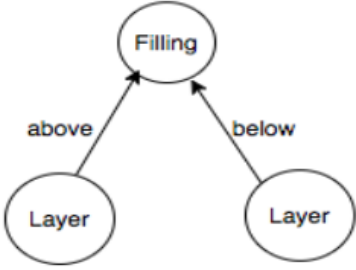
Explanation	Concept	Illustration
“Two separate layers of bread with meat, cheese, or some sort of filling between the two layers of bread”.	Current Concept	

Figure 2—Current Concept

Explanation	Concept	Illustration
<p>Cheese Quesadilla satisfies the “Current Concept” , but it is considered a negative case as the layers are not bread , they are tortillas instead.It is the case of “near miss”,which excludes most flatbreads</p> <p>According to the new concept , the bread should be made of fermented dough only.</p>	<p>New Concept 1:</p> <p>Specialization of negative case</p> <p>Climb tree heuristics</p>	
<p>In icecream sandwich the layers can be cookies or bread of fermented dough , but the filling is frozen. Which qualifies the above mentioned concept , but it is a negative case .</p>	<p>New Concept 2:</p> <p>Specialization of negative case</p> <p>Climb Tree heuristics</p>	
<p>Turkey and swiss on potato roll is the positive case , but it does not satisfy the new concept above. In roll, breads are not above and below the fillings, rather covering the filling vertically in a round cylindrical way. We need to “generalize” the concept by removing “above” and “below” and use more generalized term as “touches”</p>	<p>New Concept 3</p> <p>Generalization of positive case</p> <p>Enlarged Set Heuristic</p>	
<p>Meatball sub is a positive case , but it does not satisfy the concept above. In the above concept, there are 2 separate breads with no link with no connection or relation between them at all.</p> <p>But , in the case of Meatball sub , 1 bread is split in such a way that it is connected at one edge and meatballs filling is between the split.</p>	<p>New Concept 4</p> <p>Generalization of positive case</p>	

Figure 3—Incremental Concept Learning

Note: If figures in this table are not clearly visible , please refer to Appendices section.

I feel "Toaster Strudel" is sweet food item which is sandwich like , and have not been discussed here . That will make the model specialized to not include sweet taste filling.

C). Classification: The table below shows classification of 6 items against 8 parameters about the content and structure of sandwich: In the above table ,

Parameters	Food Items					
	Turkey Hero	Turkey and Swiss On Potato Roll	Toast	Ice Cream Sandwich	Toaster Strudel	Cheese Quasadilla
Has two separate layers or 1 layer folded /split into two?	Yes	Yes	No	Yes	Yes	Yes
Filling between layers?	Yes	Yes	No	Yes	Yes	Yes
Filling is frozen?	No	No	No	Yes	No	No
Layers are bread of fermented dough?	Yes	Yes	Yes	Yes	No	No
Tastes sweet?	No	No	No	Yes	Yes	No
Filling covered from top and bottom?	Yes	No	No	Yes	Yes	Yes
Filling covered on sides?	No	Yes	No	No	Yes	No
Roll shaped?	No	Yes	No	No	No	No

Figure 4—Sandwich Classification

"Turkey Hero" and "Turkey and Swiss on Potato Roll" are sandwiches(positive cases) and rest 4 items are negative cases.

With the above table , it can be inferred :

A sandwich has – a).2 layers of bread made of fermented dough b).layers can be folded or split of 1 bread into two c).Sandwiches have filling between the 2 layers d). Sandwiches are not sweet in taste e). They can be roll shaped too f).The filling is not frozen f). Filling can either be covered at top and bottom or can be covered on sides.

D). Yes, Hot Dog is sandwich i). As per Incremental Concept Learning , it fits the definition of the last concept mentioned above i.e. filling is non-frozen, bread used is made of fermented dough and a bread is split to make layers of sandwich. ii). As per Classification Rules also "Hot Dog" is sandwich, and fits the criteria. iii). According to case based reasoning , hot dog is sandwich as it is almost similar to Meatball Sub in structure and filling, which has already been included in positive cases.

2 QUESTION 2

There can be several interpretations of the sentence based on the emphasis shift on each word. I have chosen “Thematic Role” Frame Representation to represent different meanings of the sentence. “*Maria didn’t say I kicked the can.*” The sentence uses a negative verb, hence I have included the “Polarity” of the verb as one of the thematic roles. (Ref. [Polarity of verbs](#))

A). In the following representation, the emphasis is mainly on the verb “say”. The sentence which is said by Maria is represented by thematic role “Content” (i.e. the content of the speech)

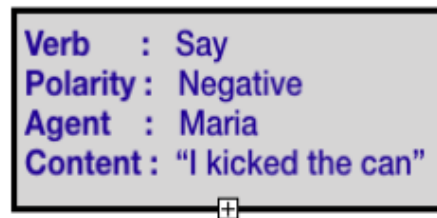


Figure 5—A. Thematic Representation

B). The other representations and their interpretations are :

i). When the emphasis is on “I”, the sentence implies - **Although Maria said that can was kicked, she was not talking about “Me”** Here the thematic Role, “Experiencer” has been used in the first frame. According to thematic role definition : “*Experiencer is an entity that undergoes an emotion, a state of being or the perception expressed by the word.*” First frame implies that, Maria did not say about “I”. Here the experiencer is “I”, which is being “not talked about” by Maria. (Ref. [Thematic Roles](#))

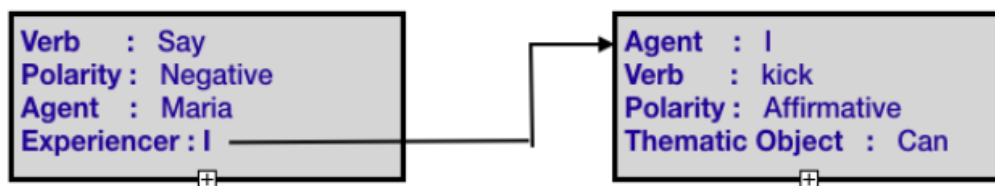


Figure 6—B. Thematic Representation

ii). When the emphasis is on “can”, the sentence implies - **Although Maria said**

that I kicked something ,she was not talking about “Can”. Here the thematic role, “Experiencer” is for entity "Can" , as per definition of "Experiencer" defined above. Experiencer is a “can” which is being “not talked about”, by Maria.

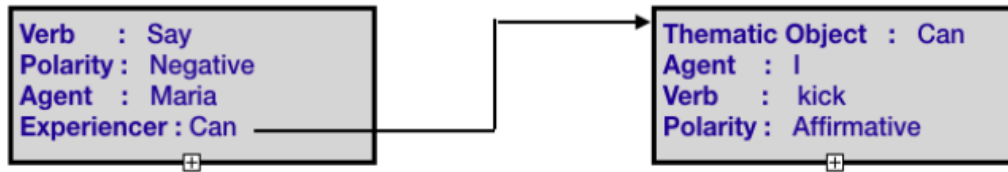


Figure 7—C. Thematic Representation

iii). Similarly ,when the emphasis is on “kicked” , the sentence implies - Although Maria said that I did some action to can ,she was not talking about the action “kick”. Here “experiencer” is something which Maria is “not talking about” and that is action “kick”. In the other 2 examples above it was “I” and “can”. Not including the frame representation due to space constraints.

C). In the above mentioned(Figure 6) representation where emphasis is on “Can” , it is represented by the role “Thematic object” , that means the literal meaning of the “can”(i.e. object) has been considered.

While to interpret the figurative meaning of the word “can” defined as “Putting off the work to a later date”, it should not be considered as a single entity “can” . It should be taken as a phrase “kicked the can” where instead of single word, the collection of words makes sense . Here emphasis is on the phrase “kicked the can” ,that is being “not talked about” by Maria. The thematic role for phrases or sentences with implicit meaning is “Light Verb” . The [article](#) talks about the “Light Verbs” and states that syntax of representation is different for the sentences with light verbs .



Figure 8—D. Thematic Representation

With the above details , it is evident that if the role used is <“Thematic object” : can> , then it is taken as the literal meaning of the object can. If it is represented as “Light Verb” thematic role , with the complete phrase as “kicked the can”, then it should be taken as its metaphorical or figurative meaning.

The paper “[Event Structures Drive Semantic Structural Priming, Not Thematic Roles: Evidence From Idioms and Light Verbs](#)” talks about semantic representation of idioms and phrases at length.

3 QUESTION 3

Toronto declaration is a statement issued by coalition of human rights and technology NGOs to protect the equality and non-discrimination rights of all the individual and groups in machine learning systems.

A).SUMMARY

1. Preamble:

- With the widespread use of machine learning systems in every field , it is required to define the proper accountability if the ML algorithms are discriminatory.
- The sovereignty of the established framework of human rights law should be maintained and shouldn't be misused behind the opaque process of machine learning or Artificial Intelligence.
- The remediation and prevention framework is established by experts and among many possible adverse impact of ML and AI algorithms , the declaration only focuses on equality and non-discrimination .

2. Using the framework of international human rights law : The statement calls to ensure that the machine learning systems are abiding by the well established International human rights law and in any circumstances not violating the equality and non-discrimination regulations of law behind opaque , non-explanatory and complex algorithms. The organizations should have a proper system in place to ensure that algorithms support diversity and inclusion and are not discriminatory.

3. Duties of states: human rights obligations : It is the main responsibility to -

- Not support or get involved in any machine learning system design that can result in discriminatory in any way. Assess the potential risks at the design

stage of the system and address it.

- To ensure transparency , clarity about the decision making process used by machine learning systems. The actions taken to make the system non-discriminatory should also be well documented.
- Public sector bodies are well informed and trained to foresee or identify any risk that may result in human rights violation when dealing with machine learning systems deployed by private sector organizations.
- Spread the awareness and encourage the diversity, inclusion and equality in science, technology and engineering sectors.

4. Responsibilities of private sector actors:

- Discover any loopholes in machine learning systems that may end up giving discriminatory results later.
- To ensure that data used in these systems is free from any bias , influence or prejudice.
- Systems and their process is transparent and understandable.
- All the efforts , actions and steps taken for prevention and mitigation of violation of human rights laws should be well documented.

5.The right to an effective remedy:The responsibility of public and private sector organizations as well as states is to establish necessary infrastructure,resources and mechanisms to provide remedy for human rights violations caused by AI systems. This means the process of effective redress should be clear , well-documented and easily available to anyone.

B).ANALYSIS: Although the declaration is a need of the hour , it brings many challenges for the organizations which are following the traditional practice of automated decision making systems without addressing the issue of bias being increased many folds in the process. It is a well known fact that we live in a biased world and our actions too are biased(consciously or unconsciously).That bias reflects and gets amplified in the user data which is fed to ML algorithms. It is not easy to uphold the regulations and laws without any actions such as - making significant changes in the system or discarding the entire system which may result in violation. Here are few such examples-

- System looking at the house loan application may reject the applicants of a certain class and since modern ML systems process large amounts of data in-

stances ,it can be hard for designers and programmers to understand exactly which data point may have caused the system to reject an applicant.For example - the “Postal code” in the loan application is very important and decisive attribute since it carries the information about real estate prices in the neighborhood. On the other hand , it carries the racial information too since certain areas were predominantly occupied by black people. In that case it is a challenge for the organization to remove the “postal code” attribute because it is injecting bias in the system.

- According to recent report ([IBM Report](#).) IBM is stopping all the ongoing work related to facial recognition technology.In the past facial recognition technology has proven to be biased against the people of certain ethnicity , race or gender in many instances. IBM CEO Arvind Krishna stated in the letter to congress - *“IBM will no longer offer general purpose facial recognition or analysis software.The company will also no longer develop or research the technology.”*

Risks If Discarded: In the absence of any regulation , people will reject the systems which produce biased outcomes anyways. But only private sector actors will be affected. It would still be a compelling need for private organizations to ensure the bias and discrimination free automated decision making, for gaining the trust of their customers. But without the laws in place , private players may hide the bias behind complex , opaque systems and just convince users that the systems are trustworthy. If the states/governments are using such systems then results can be disastrous.If states use biased and discriminatory automated systems in sensitive matters like child welfare , education, surveillance,bail, sentencing etc..to name a few ; it will create a biased society and unrest among people as we are experiencing these days in a form of protests.

Improvements Suggested :The declaration only provides the rules ,regulations and suggestions but fails to provide the techniques which can be used to remove the discrimination from the ML System such as making datasets more diverse, having diverse technical teams as well as softwares and tools to predict the discrimination and remove it. I would also include the case studies or examples from various areas showing how the automated decision making can be made non-discriminatory. A paper in the reference is an excellent example to include([Ref](#).)

4 QUESTION 4:

Although it is a very wide and controversial topic to be discussed and difficult to put the reasoning in 2 pages .I believe personhood and identity are 2 different parameters and have different criteria to decide whether someone is the same person as before.

A). PERSONHOOD: According to me, the personhood and change in personhood can be described as below: *"A combination of physical and mental abilities/traits of any "HUMAN" at any given time t_1 as compared to physical and mental abilities/traits at point t_2 ".*

For any person -

If the change in personhood is less than threshold

Then the person is "SAME"

Else:

The person is "NOT SAME".

For comparison , we need some threshold - below or above which the person can be considered the same or changed . As humans we undergo drastic changes in each stage of our life starting from foetus to old age. The infant me and the adult me are very much different in skills, in thinking and in physical appearances and at which single point I ceased to be the same person as before is difficult to decide.

I would argue that there are degrees of personhood and it is upto us to define at which degree of change we consider that the person is no longer the same. The threshold of personhood has not been defined yet. Some people who have a working brain but lost their other body parts due to accidents will still be considered as the same person , despite their changed physical abilities . In that sense Ethan is still the same person despite his modified physical abilities. Similarly Sofia's has got artificial brain parts , but still retains all other body organs that can be considered to be the same person as before the transformation. May be for higher values of threshold discussed above.

But the same does not apply in the case of Akhila . She has been modified upto the extent that there is no organic matter left in her body. She can be considered a machine or alien replicating the traits of "Akhila" but not human. The concept of personhood is applicable to humans (living beings) only.

B). IDENTITY: According to my understanding the identity of a person is - *"characteristics and qualities that jointly define a person as a unique individual,*

distinct from others.” . These characteristics can be -

1. physical appearances such as tall , black eyes , golden hair.
2. acquired skills such as great footballer , nice singer or fast runner.
3. inherent qualities such as fast speaking person ,slow walker , or any idiosyncrasies .
4. Any past achievements or failures associated with the person.
5. Relationship or behavioural traits like short tempered , stubborn or soft spoken.

Any persistent quality that one has and defines his/her’s uniqueness can be part of one’s identity. Any artificial modification in such qualities changes the person and person does not remain the same before.

In case of Ethan - His strength , ability and quality was to conquer the highest peak in the solar system which he has acquired by self determination, muscle training, hard work and hence is worthy of respect or admiration. After the transformation, if Ethan excels in the field, his ability or quality is not worthy of admiration and his self identity is affected. Ethan will not see his enhanced skills and success as his own achievements. In that case technicians, doctors and engineers who modified/enhanced his physical abilities will be worthy of praise and admiration. Ethan’s self and social identity is changed hence Ethan is not the same per person as before. Similarly, in case of Sofia, her mental skills have been modified once she has got the frontal lobe in her brain augmented and at that moment she has got super skills like very high working memory and attention span . Her self and social identities are changed and she is not the same person anymore for the same reasons stated above for Ethan As stated in “personhood” section that Akhila can not be considered “human” or “person” after all the transformation As per identity , she was not the same person anymore after her first transformation.

Conclusion : According to the definition of “personhood” - In the absence of any threshold defined for “change in personhood” . I am assuming for a reasonably high value of threshold , Ethan and Sofia can still be considered the same people. On the contrary ,according to “identity” (self identity, social identity or cognitive identity) , Ethan and Sofia are changed at the moment they get their first artificial transform.

Akhila can not be considered as same anymore for the reasons and definitions of parenthood and identity described above.

5 REFERENCES

1. https://www.accessnow.org/cms/assets/uploads/2018/08/The-Toronto-Declaration_ENG_o8-2018.pdf
2. <https://www.forbesindia.com/article/special/dealing-with-bias-in-artificial-intelligence/56251/1>
3. https://en.wikipedia.org/wiki/Affirmation_and_negation
4. <http://www.linguisticsnetwork.com/semantics-thematic-roles/>
5. <https://www.frontiersin.org/articles/10.3389/fpsyg.2017.01089/full>
6. https://courses.helsinki.fi/sites/default/files/course-material/4595611/Kamiran2013_Article_Qua

6 APPENDICES

Following figures can be referred , if not clearly visible in "Incremental Concept Learning" , Figure -3 , for question 1

A).New Concept 1 : Cheese Quesadilla satisfies the “Current Concept” , but it is considered a negative case as the layers are not bread , they are tortillas instead.It is the case of “near miss”,which excludes most flatbreads According to the new concept , the bread should be made of fermented dough only. **Specialization of negative case ,Climb tree heuristics**

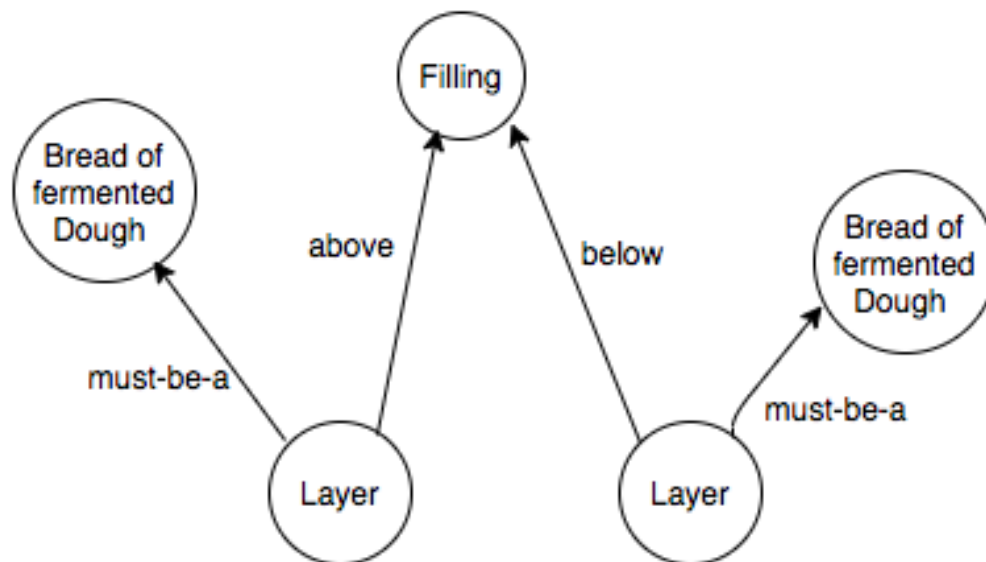


Figure 9—New Concept 1

B).New Concept 2 : In icecream sandwich the layers can be cookies or bread of fermented dough , but the filling is frozen. Which qualifies the above mentioned concept , but it is a negative case .

Specialization of negative case ,Climb tree heuristics

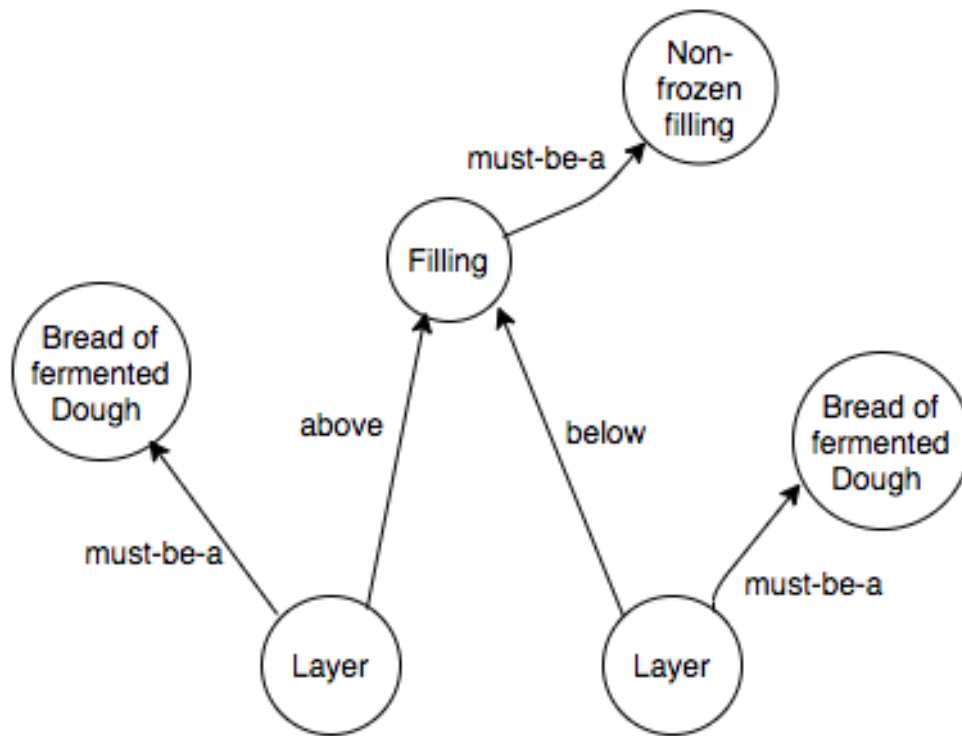


Figure 10—New Concept 2

C).New Concept 3 : Turkey and swiss on potato roll is the positive case , but it does not satisfy the new concept above. In roll, breads are not above and below the fillings, rather covering the filling vertically in a round cylindrical way. We need to “generalize” the concept by removing “above” and “below” and use more generalized term as “ touches”

Generalization of positive case, Enlarged Set Heuristics

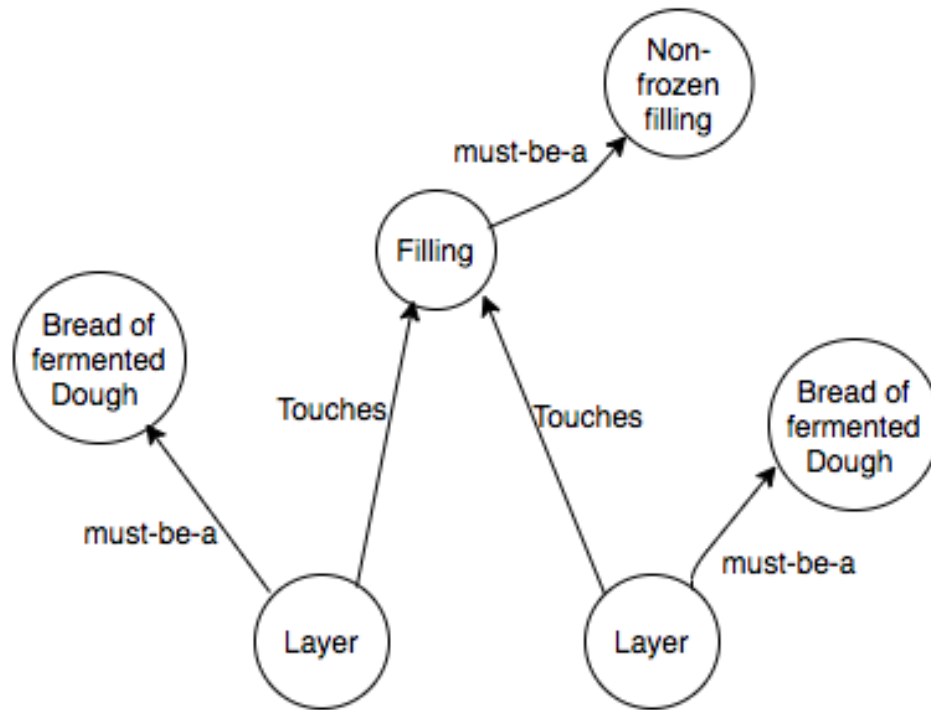


Figure 11—New Concept 3

C).New Concept 4 : Meatball sub is a positive case , but it does not satisfy the concept above. In the above concept, there are 2 separate breads with no link with no connection or relation between them at all. But , in the case of Meatball sub , One bread is split in such a way that it is connected at one edge and meatballs filling is between the split.

Generalization of positive case

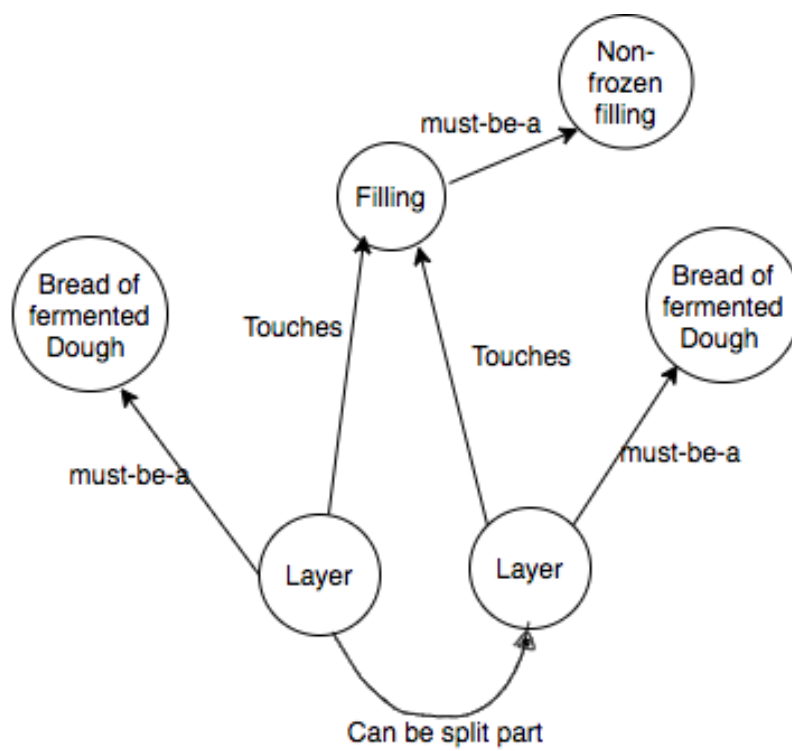


Figure 12—New Concept 4