

CS 8803 B – Artificial Intelligence Fall 2002

Class Notes: 10/18/02

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Revision

Premise behind case/instance based reasoning:

1. Much of intelligent activity is routine work, e.g. brushing teeth
 - No room for search
 - No room for planning
 - Yet every situation is slightly different from all previously encountered situation
2. The world displays regularity
 - Every new situation is slightly different but very much the same
 - There for it is required to access past experiences and tweak them a little bit

As the gap between new and old situation increases, case/instance based reasoning starts to have serious problems

Today's Topic

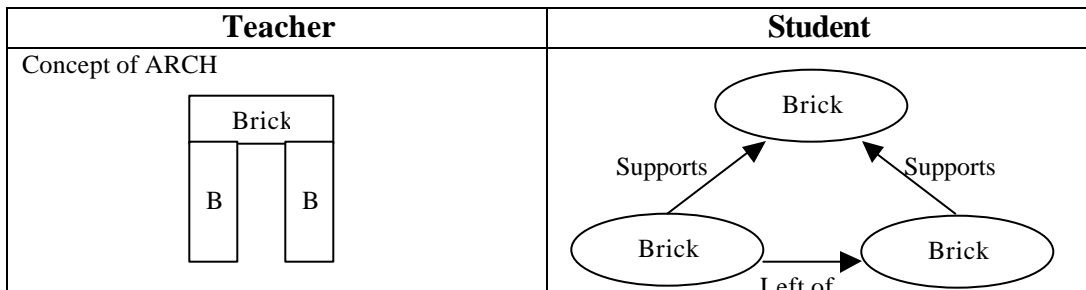
Examples → Concepts

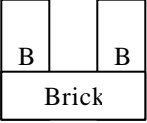
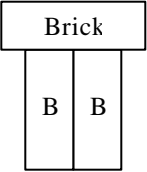
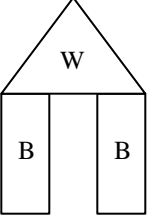
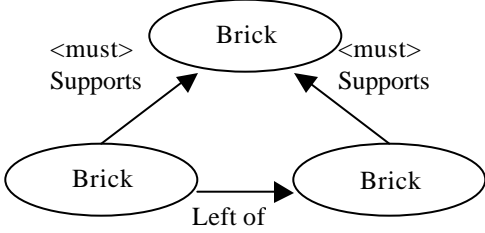
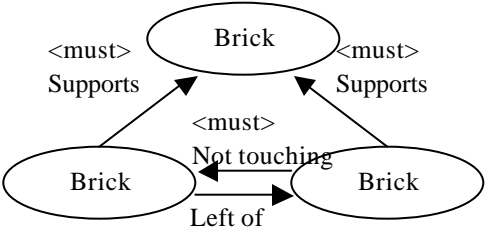
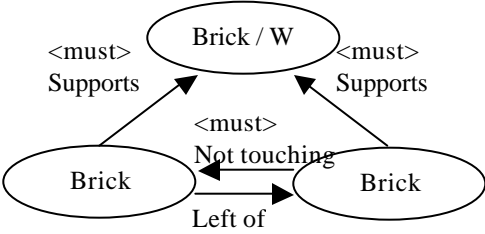
How do we form concepts from examples?

Two kinds of learning:

- Supervised Learning
- Unsupervised Learning

Today Supervised learning (SL) is covered. SL is characterized with the involvement of a teacher in the learning process.



<p>Teacher tells the student that this is a “+ve” instance. This is an ARCH.</p>  <p>“-ve” instance, “Not an ARCH”</p>  <p>“-ve” instance, “Not an ARCH”</p>  <p>“+ve” instance, “This is an ARCH”</p>	<p>Student forms the first conceptual model of the instance/case</p>  <p>Student specializes on the conceptual model by adding <must> on the respective links</p>  <p>The new example is negative and current model cannot be specialized to account for it. The current model is therefore incomplete. At this point the student goes back to the one of the previous models formed as result of a positive example and starts adding features. To complete the model. He/she then goes through the negative examples once again to specialize them, thus forming the conceptual model as shown above</p>  <p>On presentation of this “+ve” example the student generalizes the conceptual model to add a wedge to the supported entity.</p>
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Characteristics of SL:

Teacher’s role

- Ordering of examples/cases/instances is critical
- Examples should include a mix of “+ve” and “-ve” examples

- The first example should be “+ve”
- The first “-ve” example should not be far off in the training
- The “-ve” examples should be near misses, to help the student form closer boundaries for classifying the concept.
- Student should be able to identify the feature to focus on. In an ideal training set, a “-ve” example is one that distinguishes exactly one feature

Student’s role

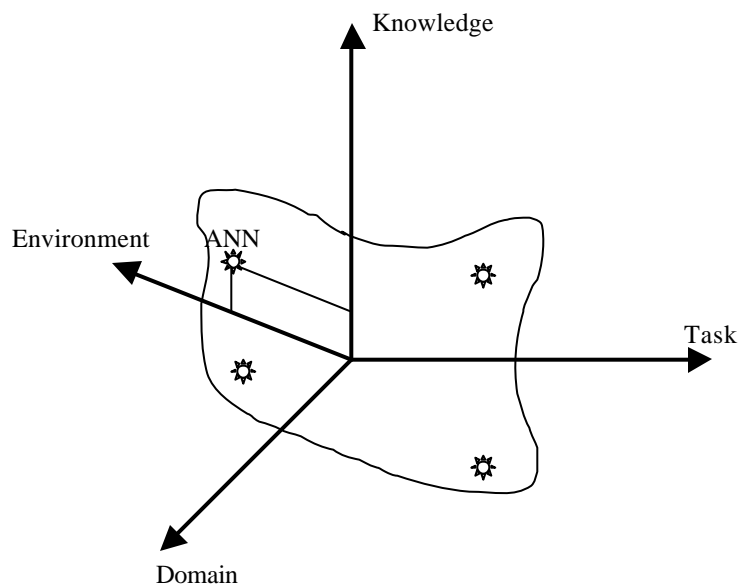
- Every time you get a “-ve” example → **Specialize**
- Every time you get a “+ve” example → **Generalize**

Q: How is this different from Supervised learning in Artificial Neural Networks (ANN)?

A:

- SL assumes a lot of previously acquired knowledge, unlike ANN which starts it’s learning from the stark. Eg. The relationships *Supports*, *Left-of* etc.
- In ANN it is Right/Wrong unlike SL where it is “+ve”/“-ve”. Example of ANN learning: Spellings
- In SL example and whether it is positive or negative is given before the student classifies it as anything, but in ANN right or wrong feedback is given after the classification has been done.

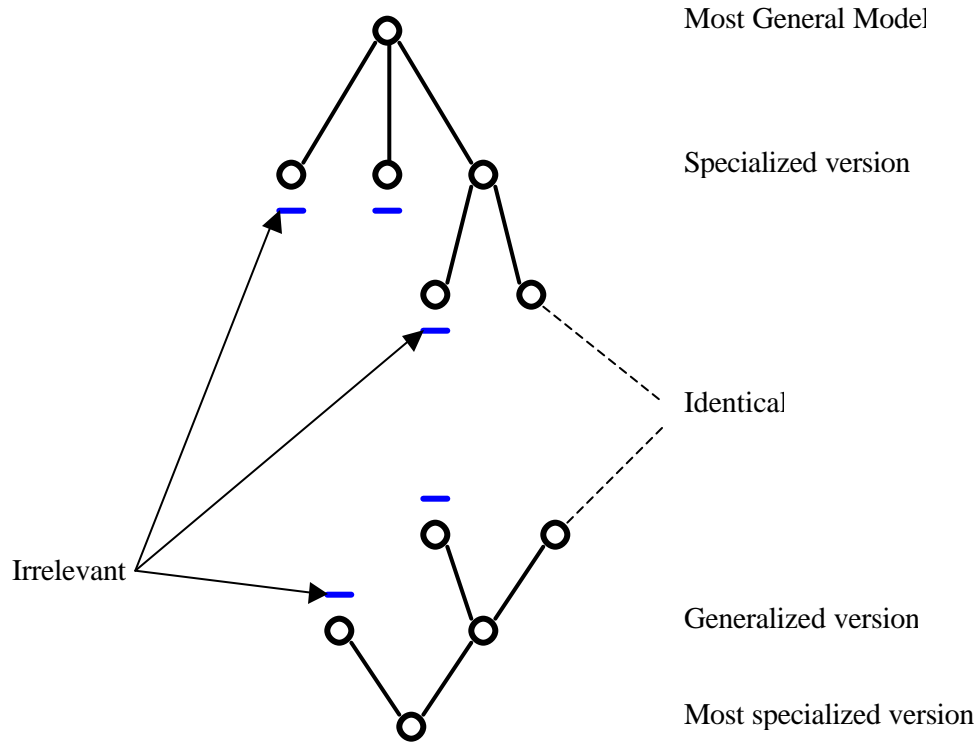
Comparing learning methods



By above graph we can form a hyperplane for all methods and define learning.

Let us relax the teacher's role (the role is defined above)

If the teacher presents disparate concepts during the training, the student may form multiple models. We can form multiple models or multiple versions of the model, but we do not know which one is correct.



With the coming of the first example we start with the most generalized and the most specialized model of the concept. As more and more examples come in, the student forms more specialized and more generalized models of the concept from the top and the bottom of the tree respectively. When models in the top part of the tree and lower part of the tree conflict, they become irrelevant. The process continues until identical models are found in the two trees.

Name	Price	Rains?	Bar	Decision	
Jason's	Medium	No	Yes	Yes	Specialized Node
?	?	?	?	Yes	Generalized Node