

Seeing AI beneath the surface

A goal of this assignment is that you link comments in the public sphere, like a TV news magazine, with AI concepts and ethical issues. You will watch two videos (of less than 15 min each) as a group, and answer a number of questions. Submit your answers as a PDF.

Watch this 60 Minutes 2010 story on high frequency trading

Watch this 60 minutes 2014 story on high frequency trading

1. Give the time intervals from the two videos that you think directly concern AI, including machine learning, together with your explanation of why you think these intervals are (potentially, even probably) references to AI technology and concepts, or implications of these. Your explanation should start with a brief summary of the topic of the video snippet. The answer to this question can be a list of items, each formatted as follows:

Video 20XX: start time of an interval, end time of an interval: explanation

2. How might the discussion in the 2014 video diminish or otherwise qualify the statement from the 2010 video that “liquidity”, as defined in the earlier video, is a benefit of high-frequency trading?

3. (a) List one or two examples of trading rules, given in the videos. Give this rule or rules as “IF-THEN” statements: IF <X is true> THEN <do Y>. Notice that the THEN part is an action. (b) For each of the rules that you list in (a), give an IF-THEN rule of the form IF <X is true> THEN <Z is true> that you believe could be learned by machine learning, and that you believe could be used to trigger the Y action(s) of the part (a) rule(s). (c) For your part (b) rule(s), explain what Market behaviors might cause the part (b) rule(s) to be learned.

4. Give an example of a policy that was instituted to protect “the Market” in the wake of high-frequency trading.

1. Give the time intervals from the two videos that you think directly concern AI, including machine learning, together with your explanation of why you think these intervals are (potentially, even probably) references to AI technology and concepts, or implications of these. Your explanation should start with a brief summary of the topic of the video snippet. The answer to this question can be a list of items, each formatted as follows:

Video 20XX: start time of an interval, end time of an interval: explanation

Video 2010: 0:21 “highly secret instructions programmed into <computers> by math wizards”
to include (probably, primarily) machine learning instructions

Video 2010: 1:00 – a good summary of the ethical implications “usefulness, potential dangers,…”

Video 2010: 1:45 “speed and quiet efficiency of computers” -- not AI per se

Video 2010: 2:00 “most of those bets are made by machine” – reasoning under uncertainty

Video 2010: 3:20 “the computer will know when to buy and when to sell... monitoring real
time data ... and make decisions based on that” probably because of machine learning

Video 2010: 3:30 “what programmers tell their computers to do is to make a profit of a penny
or less ...” “based on statistical analysis” ... the programmers tell the machine learning
algorithm what a positive example is or a negative example is (and Kroft states the criteria
too simply – e.g, -1 penny is less than +1 penny)

Video 2010: 4:00 – don’t care about CEO – what are the features used by the ML algorithms

Video 2010: 4:25 “trading instructions programmed into the computers with complicated
mathematical formulas called algorithms”

Video 2010: 4:35 IF-THEN rules

If a stock down 5% in past week, then buy \$5 of that stock

← If a stock down 5% in past week, then expected profit in next fraction of second is 0.01 %

If a stock up 10% in past week, then sell \$10 of that stock

← If a stock up 10% in past week, then expected loss in next fraction of second is 0.015 %

The expected loss rules might be machine learned

The action rules might be used experimentally by analysts, programmed as an “expert system” and/or machine learned/refined by an AI with “actuators”

Video 2010: 5:59 “high frequency traders are getting the same information others are getting but a few fractions of a second sooner” ?????? If “others” get post-purchase information and HFTs get pre-purchase information, its not the same information

Video 2010: 6:30 speed and physical location not AI per se, though the “critical market Information” is relevant to AI inputs

Video 2010: 7:30 – HFT computers see “order flow” earlier – “order flow” is the focus on 2014 video; there is much AI behind talk about the “advantage” of seeing order flow earlier and front-loading, but not what we would call direct reference to AI

Video 2010: 10:00 can't have fairness without transparency

Video 2010: “computer goes crazy” behave in an unexpected way – what kind of rules would explain this? Model this?

Video 2010: 11:55 circuit breakers – more than 10% in a 5 minute period

How can AI be used to guard against other AIs behaving in “unintended ways”?

It would be very hard to create an accurate “market simulator” in which experimental AIs could observe the behavior of AIs, but can we look at the conditions under which circuit breakers were triggered? Can we someone develop “trading chatbots” that interact with each other as real markets unfold? Can we develop a “safe” software development paradigms? Or do we create policy that guards against HFT?

Video 2014: HFT from 30% → 50% + between 2010 and 2014

Video 2014: lots of vague references to speed and complexity, but AI is behind the curtain

Video 2014: 2:30 if you can't understand it, then you can't question it !!!

Video 2014: 2:40 “fast is the operative word” so is “intelligence”

Video 2014: 3:10 see your order and “play it against other orders” – almost certainly some AI in front-run effectively. What is a rule for front-running?

Video 2014: “plumbing” through fiber-optic networks is relevant, and routing fastest paths (potentially an AI optimization problem)

Routing from farthest to nearest is a great idea that mitigates HFT advantage – not AI, but HI

2. Claim: liquidity enables you to buy a stock when you want to buy it.

What it means to “buy when you want to buy it” is relative to time scales and the actions of others. If I want to buy before a HST dives up the price, and can’t, then that’s the (lack of) liquidity I may care more about

4. Policy: circuit breakers – if stock moves more than 10% in 5 minutes

3a, b) Video 2010:

Video 2010: 4:35 IF-THEN rules

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3c) The temporal data from which such patterns could be learned would vary

