Mobile Robots and Human Capabilities

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Human Capabilities

Below are some things we as human do on a regular basis:

- Read
- Write
- Move
- Think
- Listen
- Comprehend

Computer Capabilities

Below are some things computers do on a regular basis:

- Read (from memory)
- Write (to memory)
- Move (if connected like a mobile robot)
- Think (computationally)
- Listen (my smartphone sort of does this)
- Comprehend (really?)

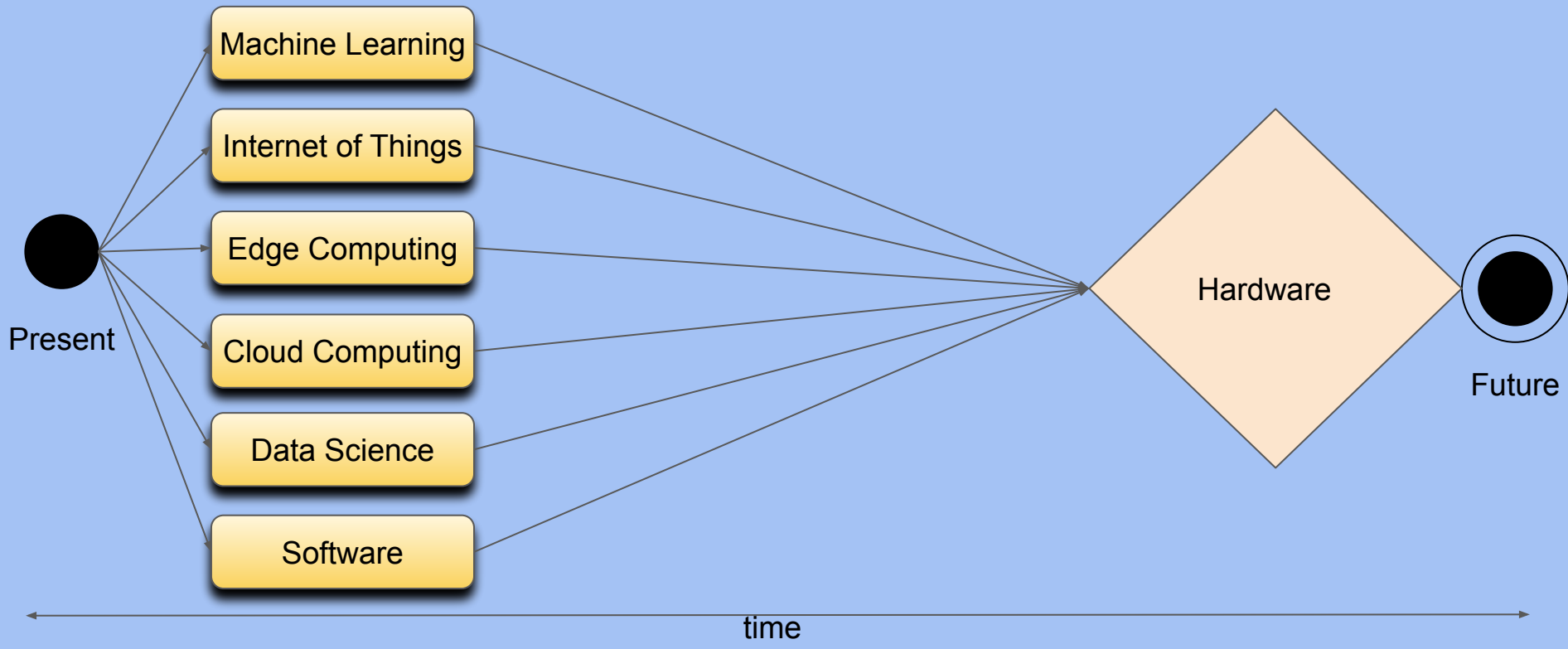
Mobile Robotics Is Where These Capabilities Intersect

- The textbook mentions all the fields of study that intersect with Mobile Robotics (Computer Science, Mathematics, Physics, Mechanical Engineering)
- The next frontier will include the implementation of features associated with us
- For many reasons, this is where computer hardware will drive the innovation

There Is So Much Detail In Simple Things

- Consider mental math
  - No tangible mutations to the outside world, just data processing
- Now consider working a math problem on paper
  - Tangible changes to a piece of paper, pencil, eraser???, cortisol levels...
- The paper method has a lot more going on in the real world and yet it is such a simple task that keeps mobile robots holding a candle to human abilities

Computer Hardware Will Be the Bottleneck



Machine Learning and Correlation

- Correlation does not imply causation.
- This problem is compounded when “machine learning encodes correlation, not causation.” (Peter Voss)
- Machine learning does make it possible to solve nondiscrete problems
- Humans still provide incorrect integrations

Internet of Things Is Not Granular Enough

- More devices does not necessarily address the problem
- Humans are a composition of body systems (skeletal, cardiovascular, nervous)
- If IoT was meant to solve the problem then devices would be smaller and more composible (more later)

Edge Computing & Cloud Computing

- These technologies solve problems by shifting where the processing happens
- This technology will be essential for mobile robots to have human capabilities
- Still does not address inefficiencies present in the current computing model

Data Science

- In addition to machine learning reliant on a human imparting application know-how, Data Science still does not address the underlying problem
- If more data is used to solve a problem, the problem becomes more computationally taxing

Software’s Short Comings

- Data overload
- Lack of intuition, wisdom, common sense
- Inefficient architecture
- Abstraction

Hardware Will Be the Problem And the Solution

- Hardware will pave the way for better computer hardware to be trained
- An automated process will have to be created for refinement of mobile robots
- The free market will determine what technologies stick around

Computer Architecture Alternatives

- The current computing model has data traversing across the same paths
- Alternatives have been proposed to decompose this model into smaller pieces
- Loose coupling and tight cohesion at the computer hardware level is essential
- According to the research conducted, it appears that In the future computers will have to learn to use their hardware

Conclusion

- Current technologies will be part of the solution that augment’s mobile robot capabilities
- These capabilities will manifest as things only humans normally are able to do
- Alternatives to current computer architecture will pave the way for the kind of computers necessary for this future