Demystifying Today's Artificial Intelligence

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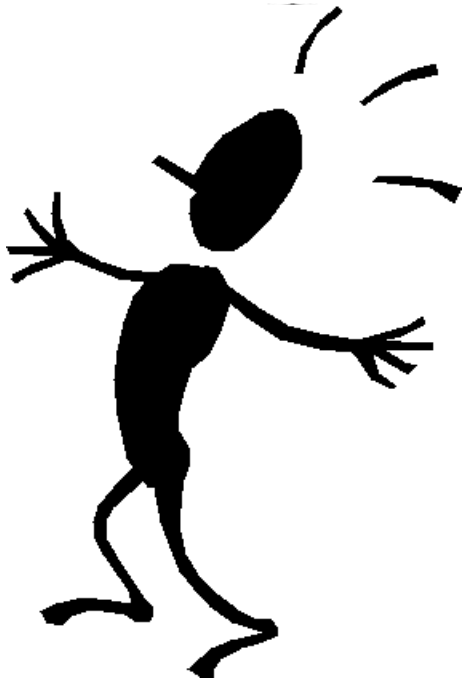
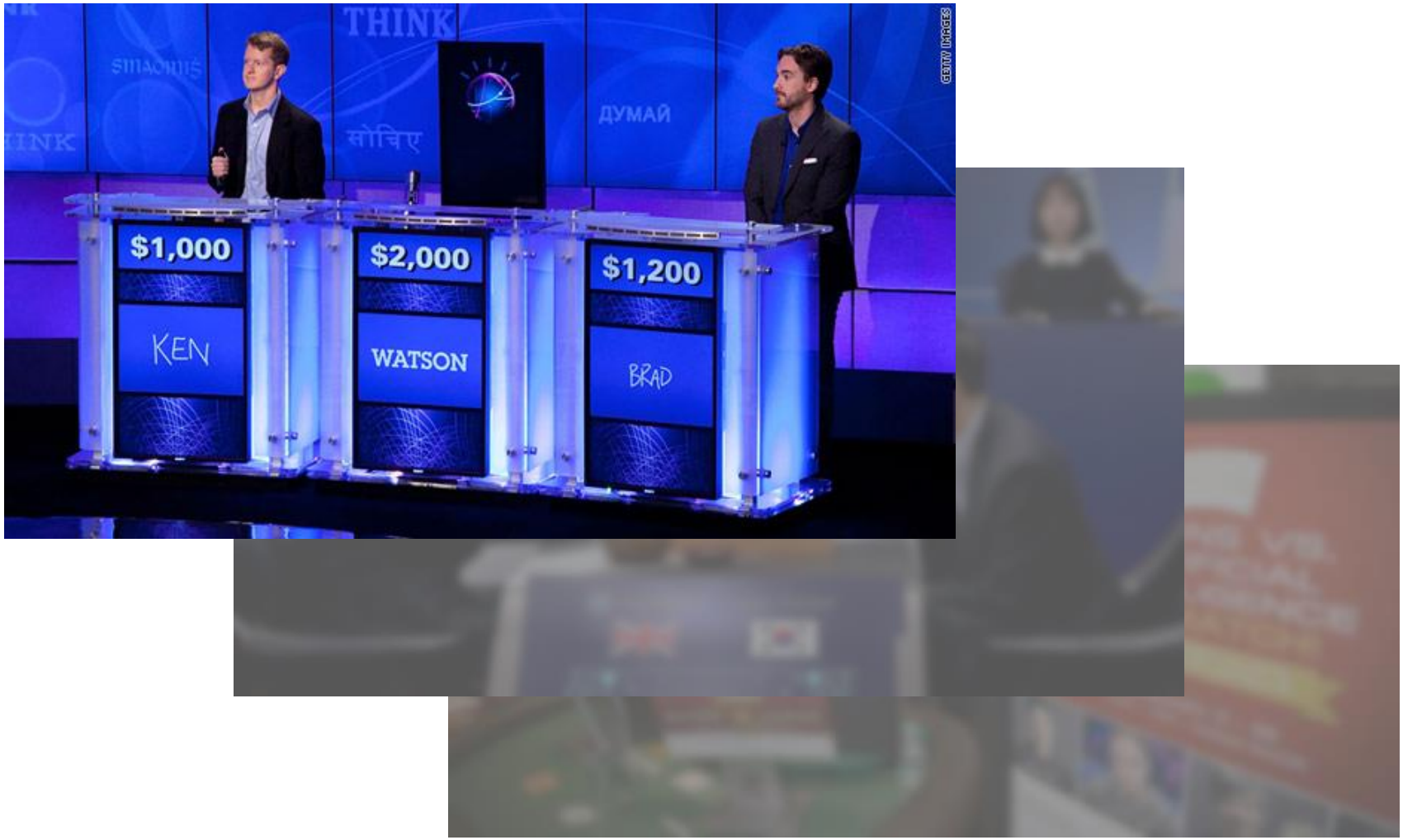
What’s all the fuss?



Emerging Technology



Emerging Technology

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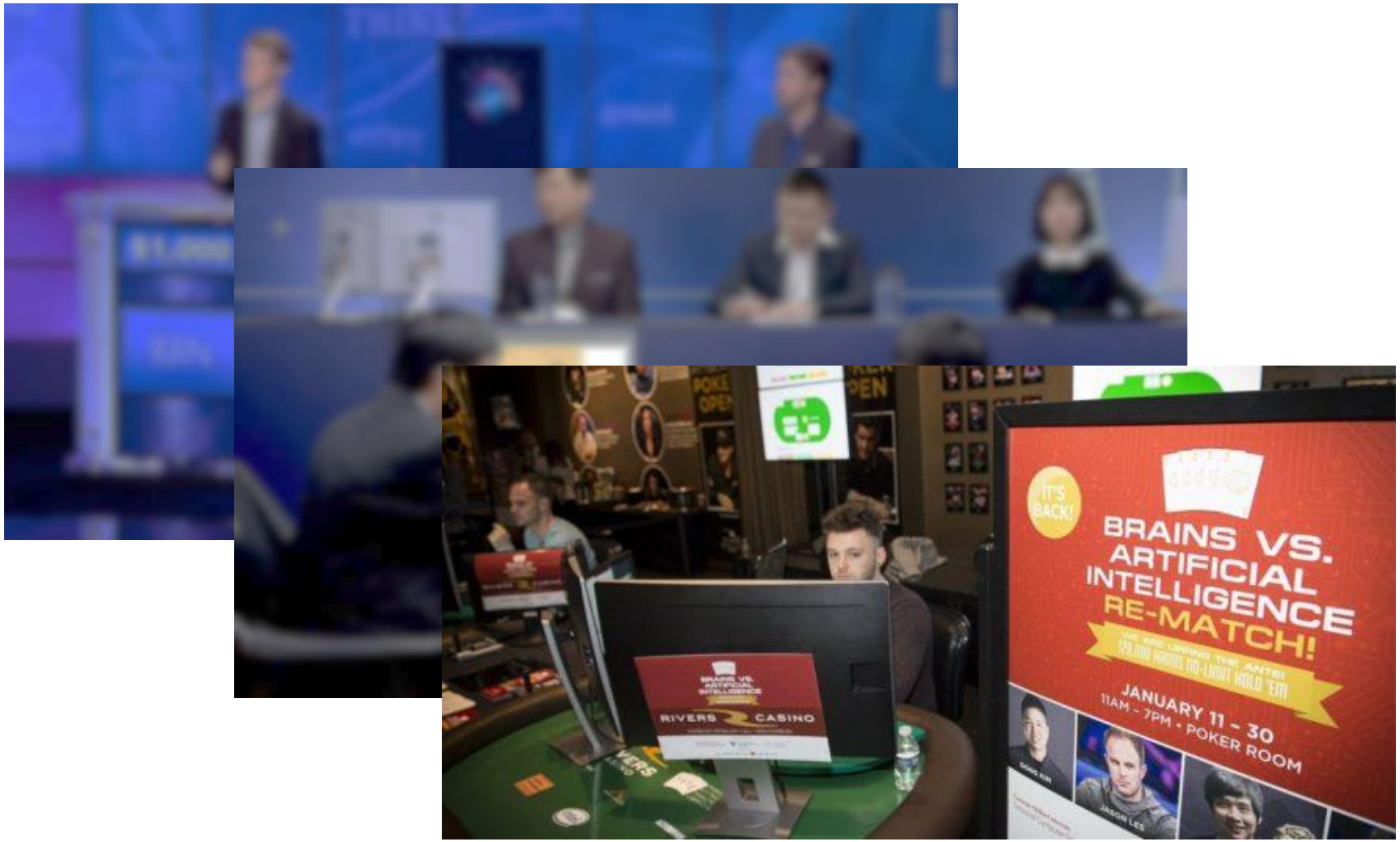

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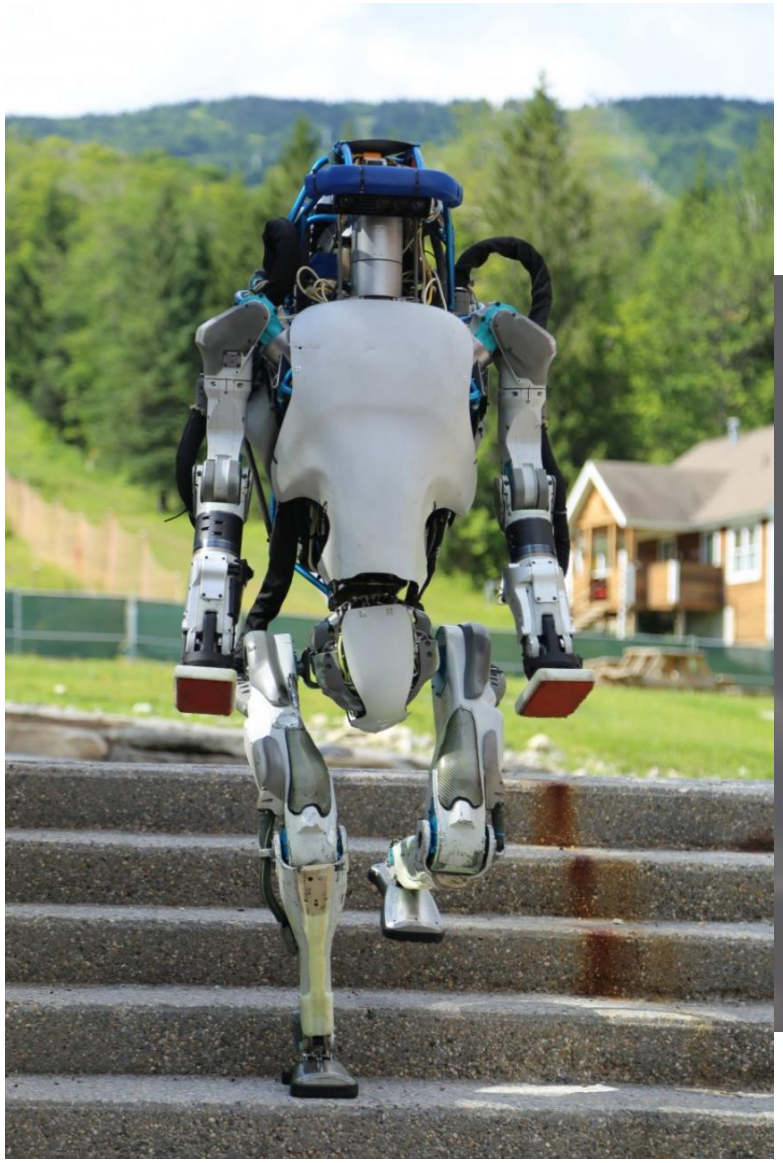
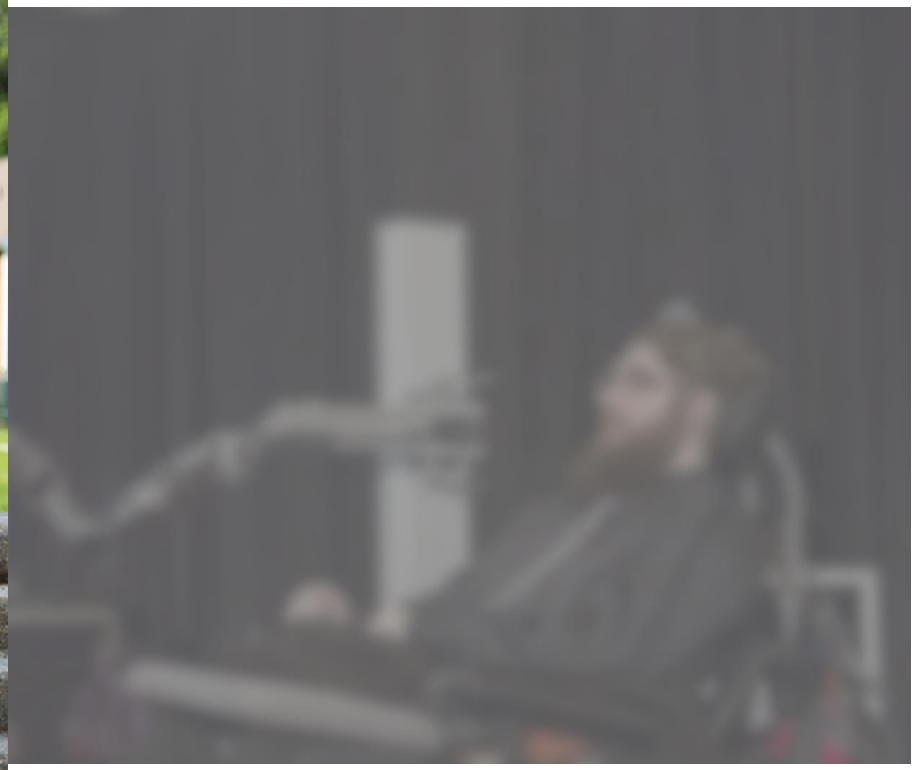




Emerging Technology

What is AI?

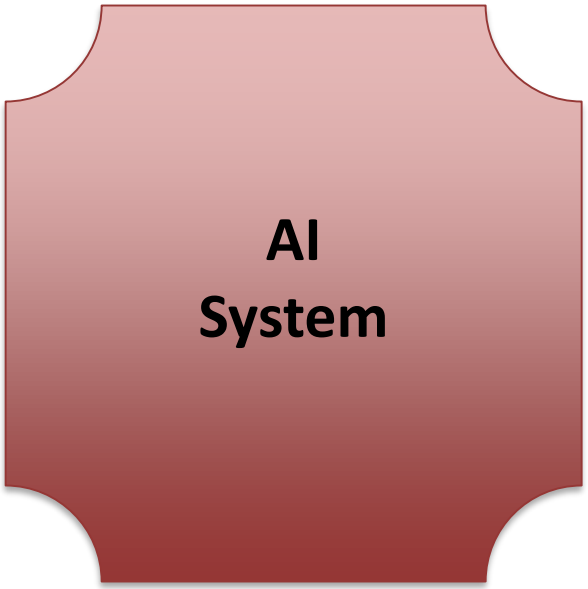
What is AI?

- Think and act like humans
- Think and act rationally
- Sometimes mutually exclusive. ☺

- AI Problem Space Categories
  - Knowledge Representation
  - Perception
  - Logical Reasoning
  - Planning and Navigation
  - Prediction

AI Conceptualization (1 of 3)

Embodied



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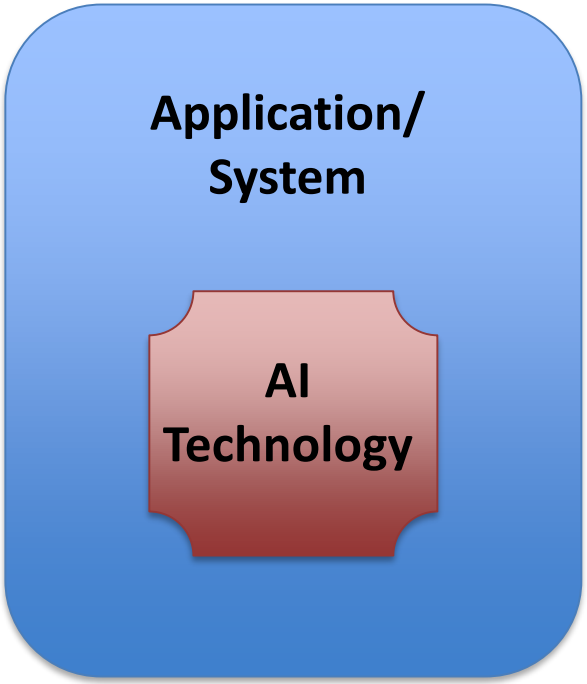
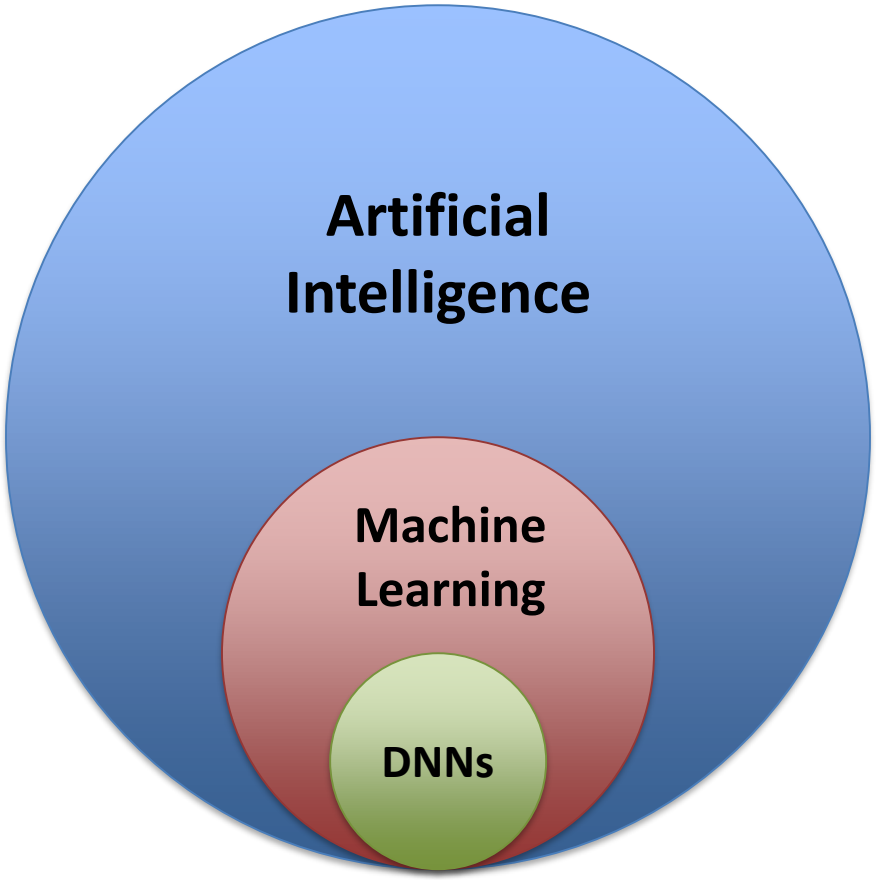


AI Conceptualization (2 of 3)



* DNN = Deep Neural Network

AI Conceptualization (3 of 3)

Narrow AI	General AI
○ Application specific/ task limited	○ Perform general (human) intelligent action
○ Fixed domain models provided by programmers	○ Self-learns and reasons with its operating environment
○ Learns from thousands of labeled examples	○ Learns from few examples and/or from unstructured data
○ Reflexive tasks with no understanding	○ Full range of human cognitive abilities
○ Knowledge does not transfer to other domains or tasks	○ Leverages knowledge transfer to new domains and tasks
○ Today's AI	○ Future AI?

New Wave of AI

- Availability of Big Data
- Improved Machine Learning (ML) Algorithms
- More Powerful Computing
- Mobile Connectivity

What can ML/AI do?

ML/AI for ...

- Classification
- Function Approximation
- Prediction
- Control
- Simulation
- Anomaly Detection
- ...

ML/AI for Manufacturing (1 of 2)

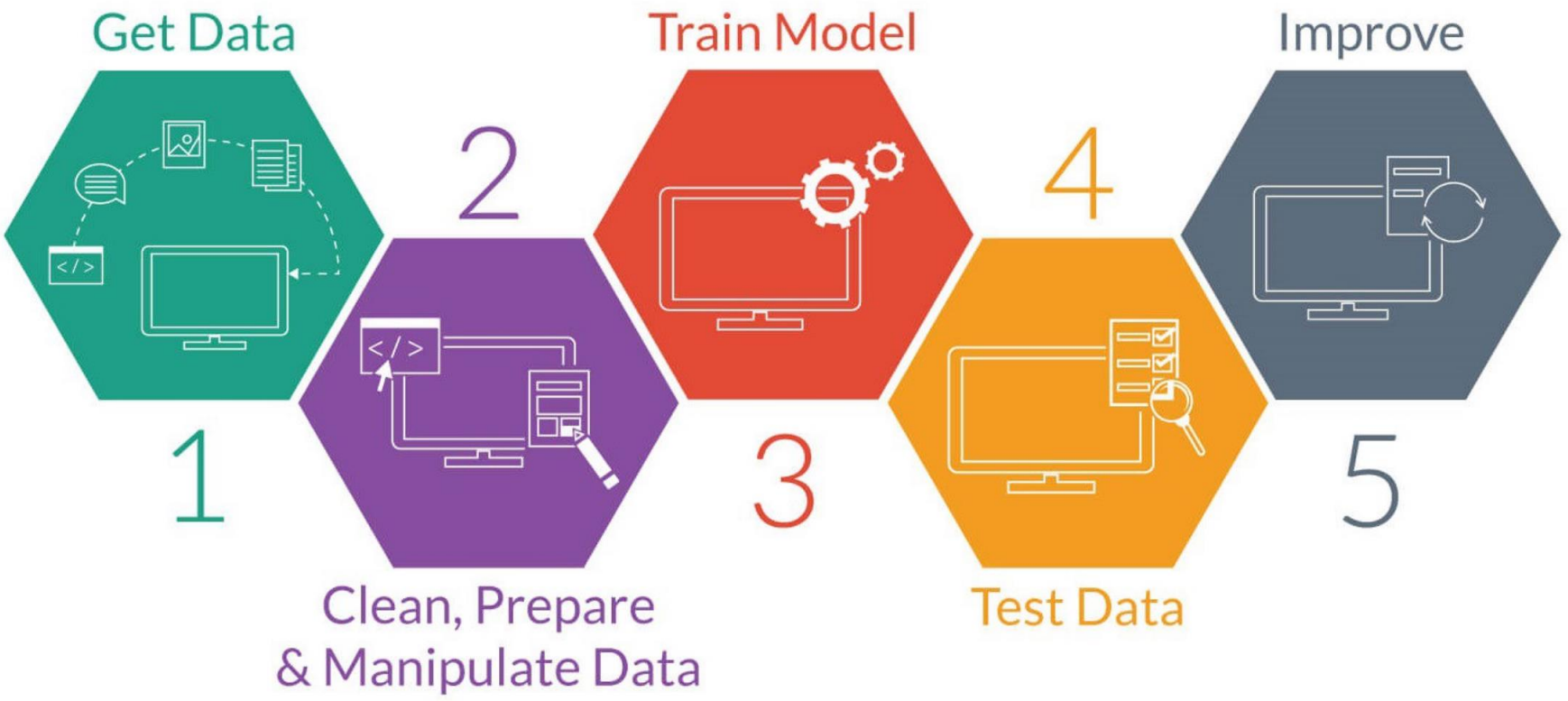
- Advanced Data Analytics*
  - Predictive Maintenance
  - Yield, Throughput, Resource Efficiency
  - End-to-End Systems Optimization
    - Including Integrated Supply Chain

* http://www.mckinsey.com/business-functions/operations/our-insights/manufacturing-analytics-unleashes-productivity-and-profitability

ML/AI for Manufacturing (2 of 2)

- Human Assistive Technologies
  - Automated Inspection and Quality Control
  - Collaborative Robots
  - Virtual and Augmented Reality
    - Training and enhanced context awareness
  - Workforce Knowledge Base
  - …

Machine Learning Workflow



https://machinelearning-blog.com/2017/11/19/fsgdhfju/

ML/AI Challenges

- Probabilistic
  - With inherent error rates and uncertainty
- Data Driven
  - With vulnerability to learning unwanted patterns of bias
- Extreme Dimensionality
  - Making decisions opaque (little explainability)

Summary: Today's ML/AI ...

- Powerful Tool
- Great Impact on Manufacturing
- Challenges and Limitations
- Life Cycle Costs

Questions?

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