
# The Transition from Unmanned to Automated

March 2014

# AICML at a Glance

- **Founded 2002**
- **Resides at University of Alberta**
- **One of the top Machine Learning research organizations in the world**
- **Since inception >110 technologies created**
- **115 heads**
  - 9 Professors (PIs)
  - 20 Lab Staff & Admin
  - 86 M.Sc., PhD. & PDFs

# AICML at a Glance

## AICML graduates go to:

### Industry

- Google
- eBay
- Microsoft
- Bloomberg
- Facebook
- 23andme.com
- Amazon
- Schlumberger
- IBM
- Bell Labs
- Electronic Arts
- Sandia National Labs
- EMC, etc…

### Academic

- Carnegie Mellon University
- MIT
- Stanford
- McGill University
- University of Waterloo
- Johns Hopkins
- Rutgers
- Princeton University
- USC
- UBC
- Purdue
- Mayo Clinic
- Numerous others: Asia, Australia, Europe

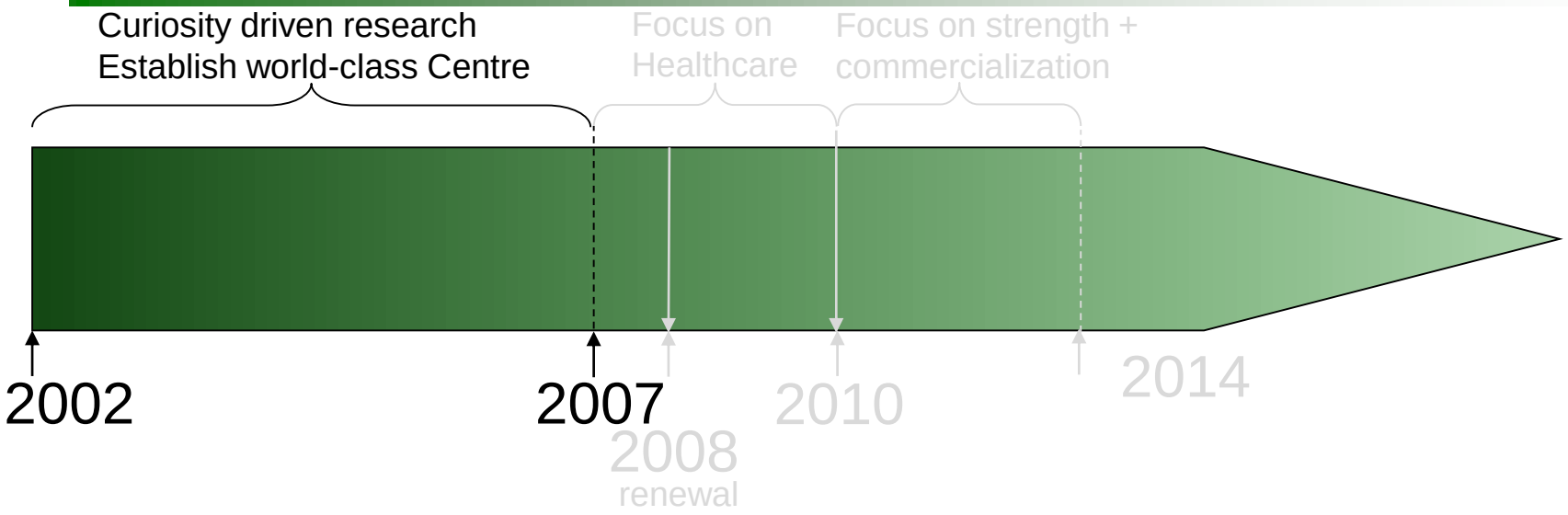
# AICML Purpose & Objectives

- **Academic Excellence**
  - Continuation of World-Class Research
  - Ongoing development of HQP

- **Commercial Translation & Impact**
  - Enable Alberta based companies/organizations to be more efficient and competitive through ML
  - Place AICML graduates in Alberta & Canada
  - Create foundation for healthy viable start-ups

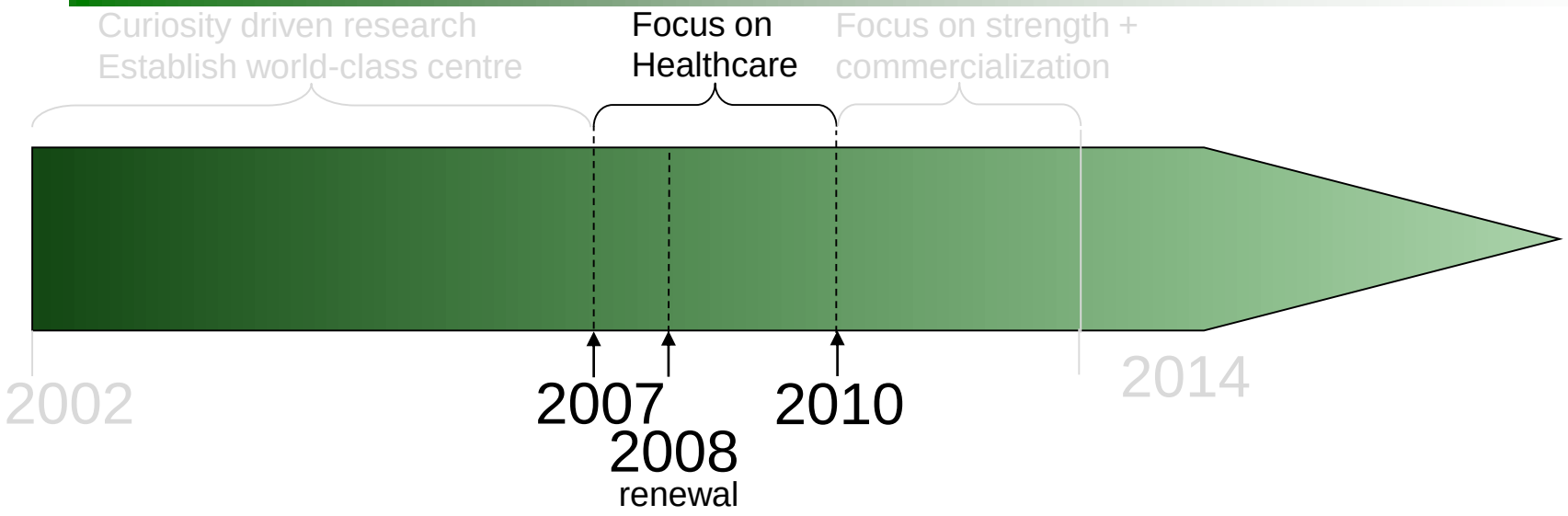
Outcomes are Contingently Linked

# AICML History



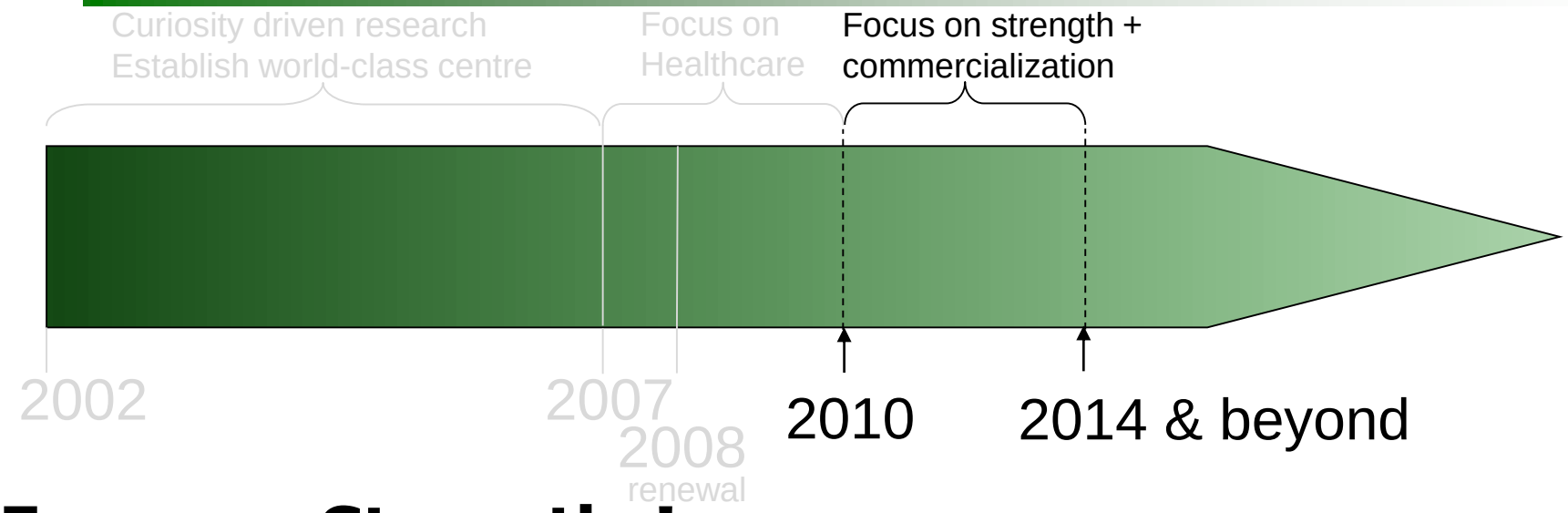

**Conduct World-Class Research 2002 – Present**

# AICML History




**2007 funder mandated focus on Healthcare**

# AICML History




## Focus on Strengths!

- Big Data & Analytics
- Natural Language Processing
- Social Network Analysis
- Optimization
- Game Theory (i.e., capital markets, military simulation, etc.)
- Reinforcement Learning

# Transition Unmanned to Autonomous

**Challenges:**

- **Computers don't understand ambiguity**
  - Sarcasm
  - Intent
  - …
- **Real-time Data Processing**
- **Common Approach – locate place & time**
- **Machine Learning is about discovery**

**At AICML we have people that can solve these challenges**

# What is Machine Learning?

- Machine Learning provides means to learn from large data, interpret the trends in the data and **<u>adapt to the data</u>** as opposed to static programs

Learn from experience – Adapt to environment

machine learning

- Medical image analysis
- Filtering data for analytics
- Control robot in unknown environment

NOT machine learning

- Accounting program
- Querying a database
- Control welding robot in manufacturing

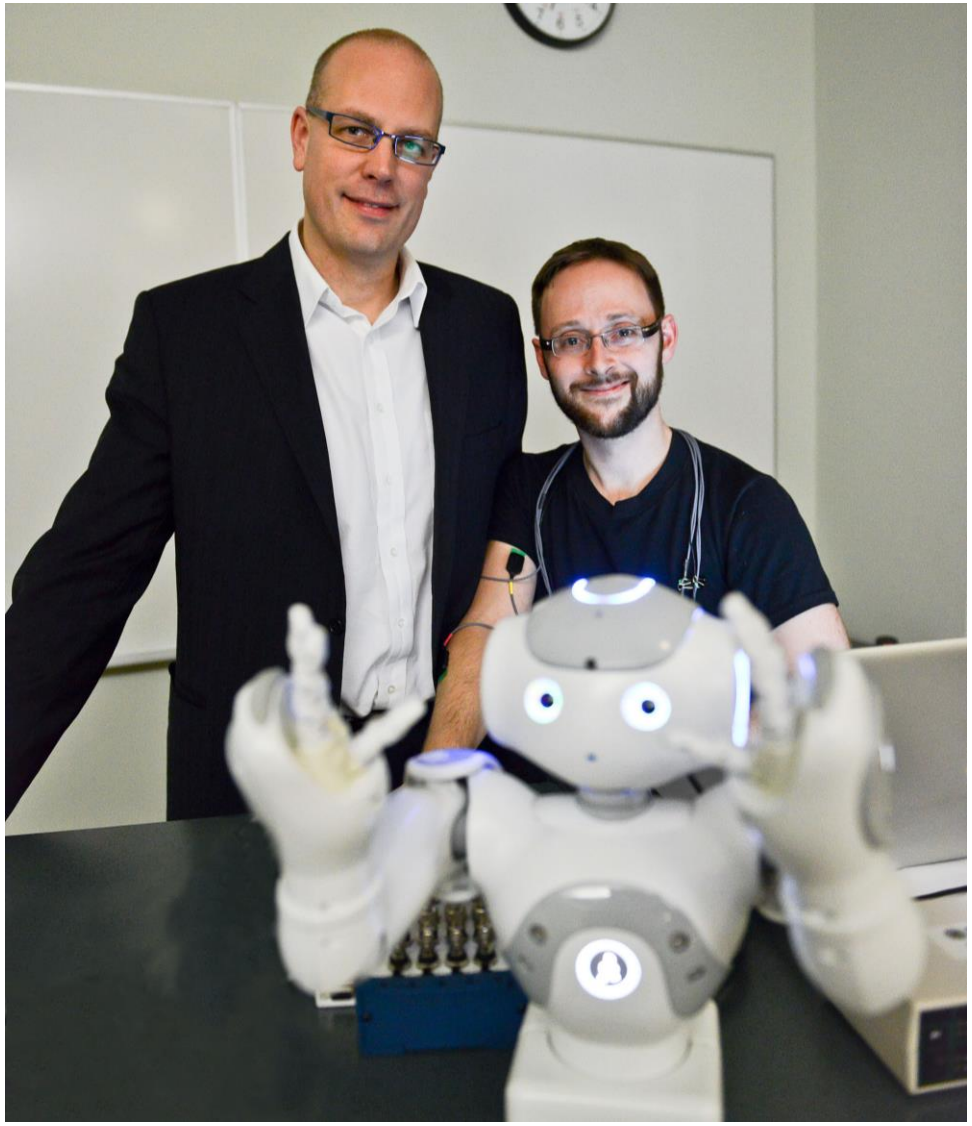
# Prior Work with Robots

# AICML Methodologies Applicable to UAVs

# Machine Learning & Robots

# What Do Robots See

# Reinforcement Learning & Robots



# Machine Learning – Game Theory

- **Checkers** (Chinook – Jonathan Schaeffer, et al)
  - 500 billion billion ($5*10^{20}$) possible positions
  - 18 ½ years of research & application
  - 2007 – top 10 scientific discovery of the year *Science*

- **Computer Poker Research Group (CPRG)**
  - ACPC – won 20 of 33 events since inception
  - Smallest game $1*10^{14}$ decision points
  - 50,000,000 hands played
  - Most CPRG members don't play poker

# Machine Learning – Game Theory

- **Common traits**
  - Incomplete information
    - Other participant's actions
    - Obfuscated information
  - Massive amounts of data
  - Large number of iterations over short period of time
  - Human psychology & behavior
  - Contingent actions – next best decision
  - …

# Contact Info

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