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Recent trends in Machine Learning

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Outline

• What is NIPS Conference
• Avoiding Bias
• Reinforcement Learning
• Meta-Learning
Neural Information Processing Systems (NIPS)
NIPS 2017

- Annual Conference on Neural Information Processing Systems
- Runs for 30+ years
- In 2017 8000+ people attended
- Might be renamed in 2018
NIPS 2017

3240 total Submissions

- 40 Oral * 1%
- 112 Spotlight * 3.5%
- 679 Posters * 20.9%

NIPS 2017: topics of submissions

NIPS 2017: submissions leaderboard (top 15)

NIPS 2017: conference notes


Overview of talks

Below are notes that give quick gist about what a particular session was about.

A zip archive of all NIPS 2017 papers is available here, good luck with dig into details :).

<table>
<thead>
<tr>
<th>Session</th>
<th>Reinforcement Learning for the People</th>
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<tbody>
<tr>
<td>Most Impressive breakthrough from the session</td>
<td>Lots of applications that could benefit from RL.</td>
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Robust and Efficient Transfer Learning with Hidden-Parameter Markov Decision Processes: optimal policies are adapted to subtle variations within tasks in an efficient and robust manner. Bayesian Neural Network both learns the common transition dynamics for a family of tasks and models how the unique variations of a particular instance impact the instance’s overall dynamics.
Avoiding Bias
Highly recommend to watch the recording.
Bias in Data

• It is everywhere
• Data does not exist in the world “as is”
• Data is “made”
Bias in Data Collection

- Example: **StreetBump smartphone app**
- Uses GPS data from smartphones to help passively detect potholes
- People with low-income?
### Bias in Allocation

- System allocates or withholds certain groups, an opportunity or resources (ex: mortgage application)

<table>
<thead>
<tr>
<th></th>
<th>denigration</th>
<th>stereotype</th>
<th>recognition</th>
<th>under-representation</th>
<th>ex-nomination</th>
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<tbody>
<tr>
<td>Image search for 'CEO' yields all white men on first page of results.</td>
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<td>X</td>
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<td>Google Photo mislabels black people as 'gorillas'</td>
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<td>YouTube speech-to-text does not recognize women's voices</td>
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<td>HP Cameras' facial recognition unable to recognize Asian people's faces</td>
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<td>Amazon labels LGBTQ literature as 'adult content' and removes sales rankings</td>
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<td>Word embeddings contain implicit biases [Bolukbasi et al.]</td>
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<td>Searches for African American-sounding names yield ads for criminal background checks [Sweeney]</td>
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</table>
Image Search: CEO
Stereotyping

He is a nurse. She is a doctor.

O bir hemşire. O bir doktor

O bir hemşire. O bir doktor

She is a nurse. He is a doctor.
Possible solution

• Social system analysis approach to the conception, design, deployment and regulation of AI systems to think through all the possible effects of AI systems
Reinforcement Learning
What is Reinforcement Learning?

Diagram:
- **Environment**
- **Action**
- **Reward**
- **State**
- **Agent**
- **Interpreter**

Wikipedia
Potential applications

- Shopping optimization (buying airline ticket)
- Tutoring games at school
- Medical prosthesis
- Sepsis treatment
Sepsis treatment

- Sepsis - severe infections with organ failure
- Leading cause of patient mortality (in UK)
- Antibiotics
- Intravenous fluids and vasopressor

Deep Reinforcement Learning for Sepsis Treatment, A.Raghu, M. Komorowski et al
Sepsis treatment with RL

- Objective: learn an optimal strategy
- More complex than prediction tasks!
Meta Learning
What is Meta-learning

• The art of learning to learn or optimizing the optimization algorithm
• Using algorithms to find the optimal hyper-parameters of a model and/or the optimal structure of a network
Deep Learning for Robotics

• What the keynote [here](#)
• Recurring theme: **Meta-Learning**
Discover algos powered by data\&experience (vs just human integrity)
Thank you for your attention!

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