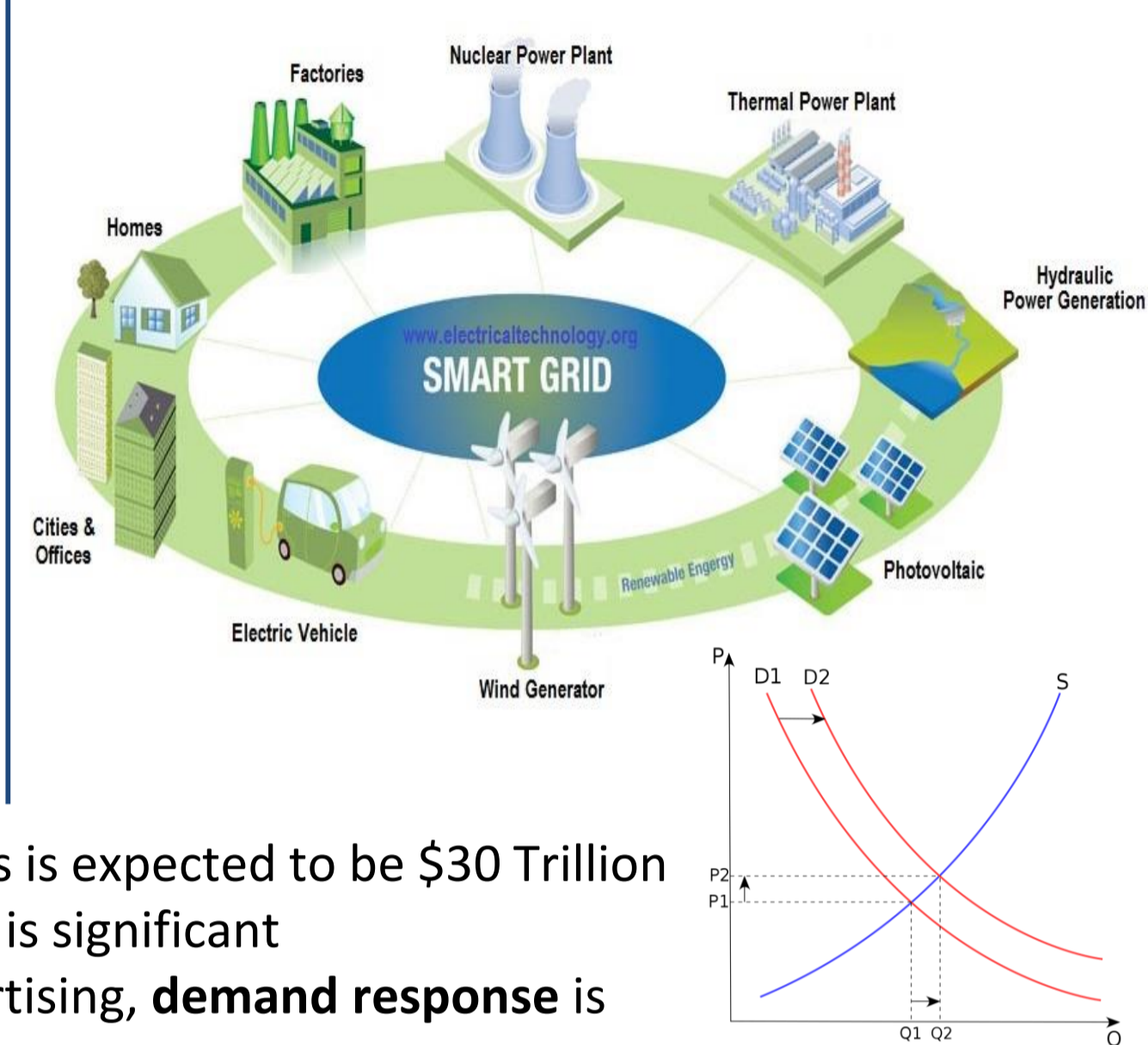


## Internet Advertising

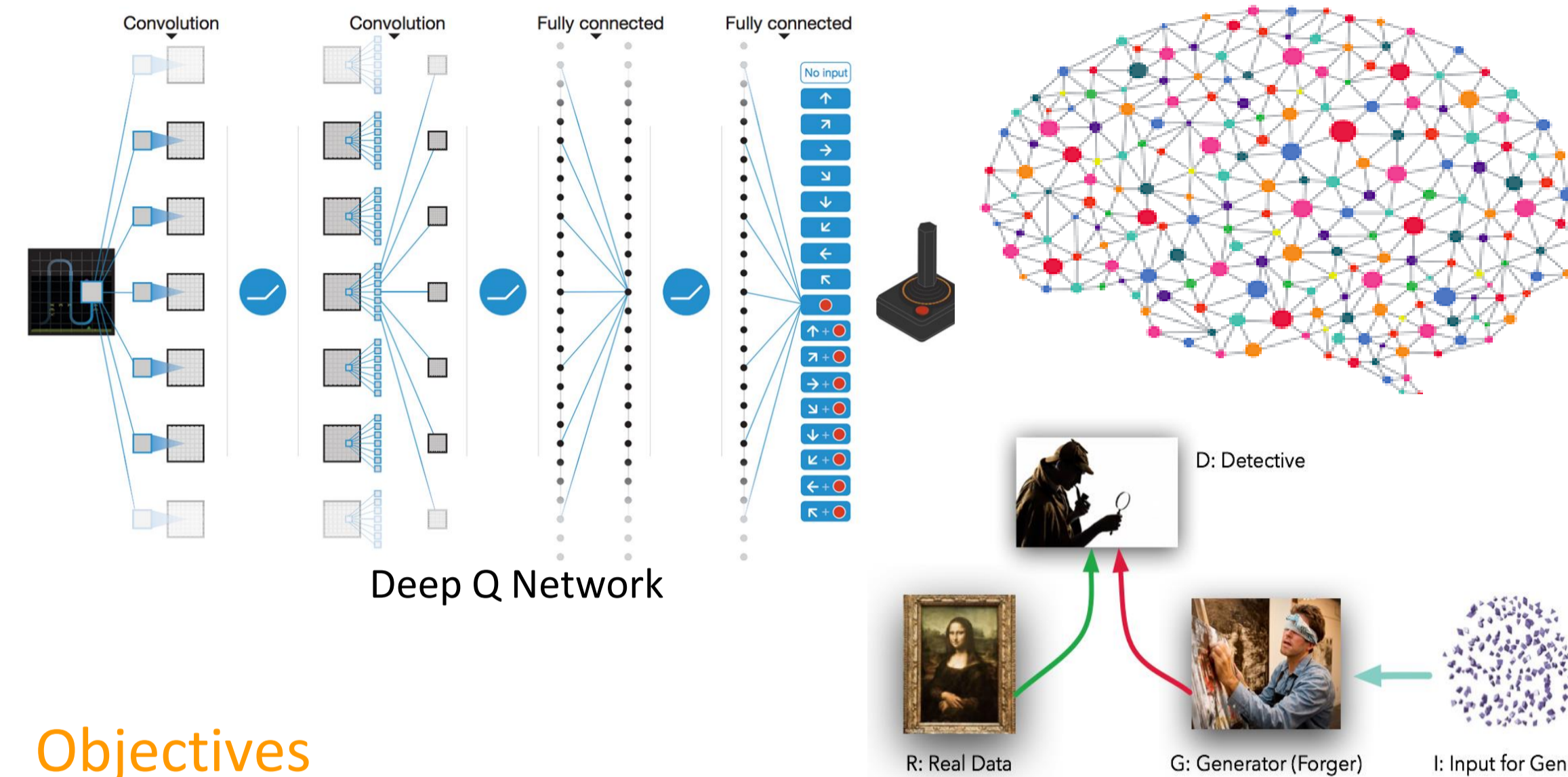


- Internet Advertising is \$100 B industry; Smart Grids is expected to be \$30 Trillion
- Any small improvement in revenue/cost reduction is significant
- **Auction** based mechanisms are deployed for advertising, **demand response** is critical in smart grids
- System needs to know certain stochastic parameters such as probability of clicks/probability of reduction in peak demand
- Need certain private information from strategic agents such bids
- Stochastic parameters can be learnt using **MAB** algorithms

## Smart Grids



## An Artificial Neural Network that can imagine



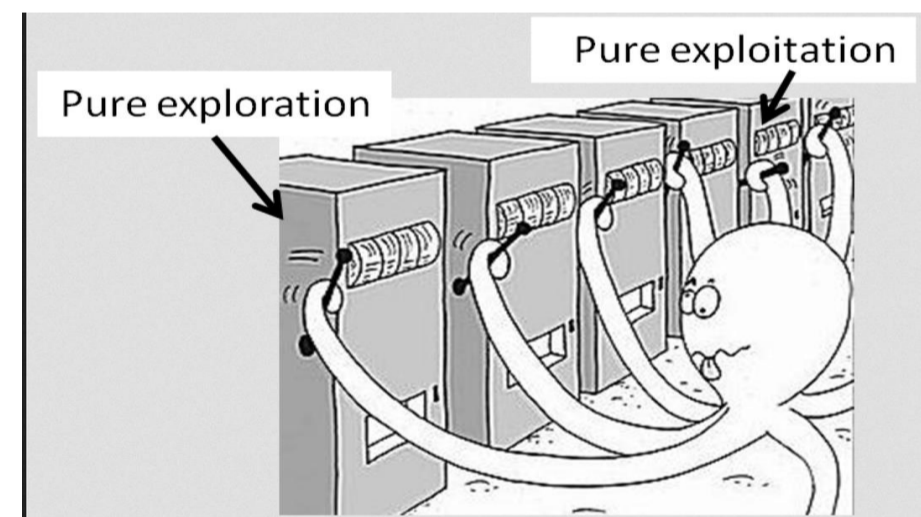
Generative Adversarial Networks (GANs) : Generative model trained with an Adversarial Game  
**A two player zero-sum game:**

- The more I win the more you lose..
- GAN game converges to **Nash Equilibrium**

	Head	Tail
Head	1,-1	-1,1
Tail	-1,1	1,-1

## Approach: Multi-Armed bandit mechanism

- Multi-armed bandit algorithm: Useful in tradeoff between **exploration** vs **exploitation**, in order to learn about unknown stochastic parameters in the system



- MAB solutions are not directly applicable, Why? **Strategic agents**
- **Mechanism design** to ensure that the agents report their private information truthfully (incentive engineering)
- This leads to the fusion of ML techniques with Game Theory

**Use of MAB and Q-Learning with Game Theory**

Designing optimal mechanisms for environments using data-driven approaches, to overcome the difficulty of solving it analytically

**Use of Game Theory for deep learning or deep learning for Game Theory**

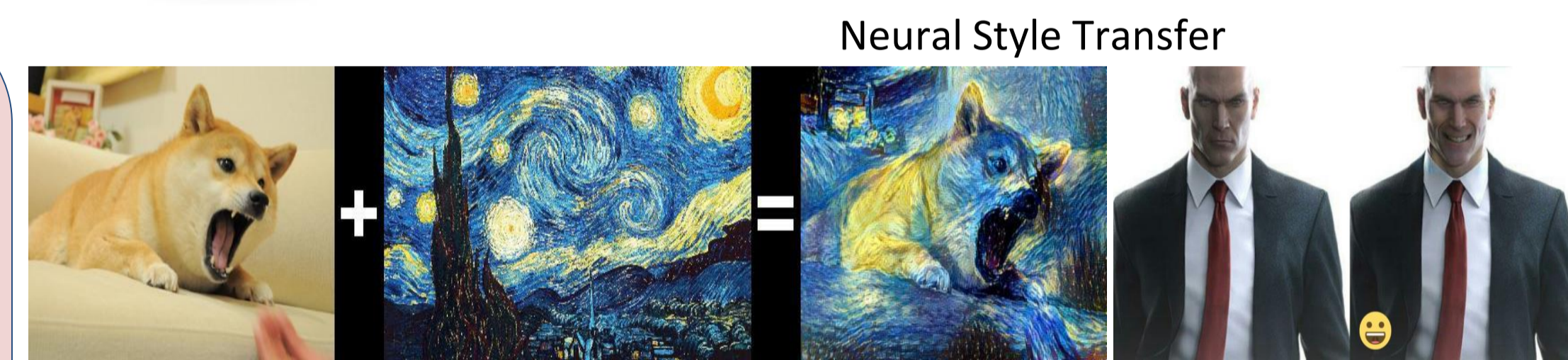
Demystifying convergence of certain machine learning algorithms using established results from Game theory

## Publications

- Shweta Jain, Sujit Gujar, Satyanath Bhat, Onno Zoeter, Y. Narahari, "A Quality Assuring, Cost Optimal Multi-Armed Bandit Mechanism for Expertsourcing", Journal of Artificial Intelligence (AI) 254 (2018): 44-63.
- Manisha Padala, C V Jawahar, Sujit Gujar, "Learning Optimal Redistribution Mechanisms Through Neural Networks". To appear in the Proceedings of International Conference on Autonomous Agents and Multiagent Systems, AAMAS 2018
- Ganesh Ghalme, Sujit Gujar, Amleshwar Kumar, Shweta Jain and Y Narahari, "Design of Coalition Resistant Credit Score Functions for Online Discussion Forums". In the Proceedings of International Conference on Autonomous Agents and Multiagent Systems (AAMAS'18).
- Ganesh Ghalme, Shweta Jain, Sujit Gujar, Y Narahari, "Thompson Sampling Based Mechanisms for Stochastic Multi-Armed Bandit Problems". In the Proceedings of the 2017 International Conference on Autonomous Agents and Multiagent Systems (AAMAS'17).
- Shweta Jain, Ganesh Ghalme, Sujit Gujar, Satyanath Bhat, and Y. Narahari, "A Deterministic MAB Mechanism for Crowdsourcing with Logarithmic Regret and Immediate Payments". In Proceedings of the 2016 International Conference on Autonomous Agents and Multiagent Systems (AAMAS'16).
- Satyanath Bhat, Shweta Jain, Sujit Gujar and Y Narahari, "An Optimal Bi-dimensional Multi- Armed Bandit Auction". In Proceedings of the 2015 International Conference on Autonomous Agents and Multiagent Systems, pp. 1789-1790. International Foundation for Autonomous Agents and Multiagent Systems, 2015 (AAMAS'15).
- Reza Hadi Mogavi, Sujit Gujar, Pan Hui, "Use More Hooks to Catch More Fish: A Case Study of StackOverflow on How to Retain the Contributing Users". Under Review.

## Q&A / Online Discussion Forums

- How to motivate users to provide high quality answers and ask good questions?
- Incentivize on the basis of scores in reputation system
- How to learn what are good incentives for every user using Q-learning/Deep Q?



Speaker ??  
 Obama style Speech generated by NN

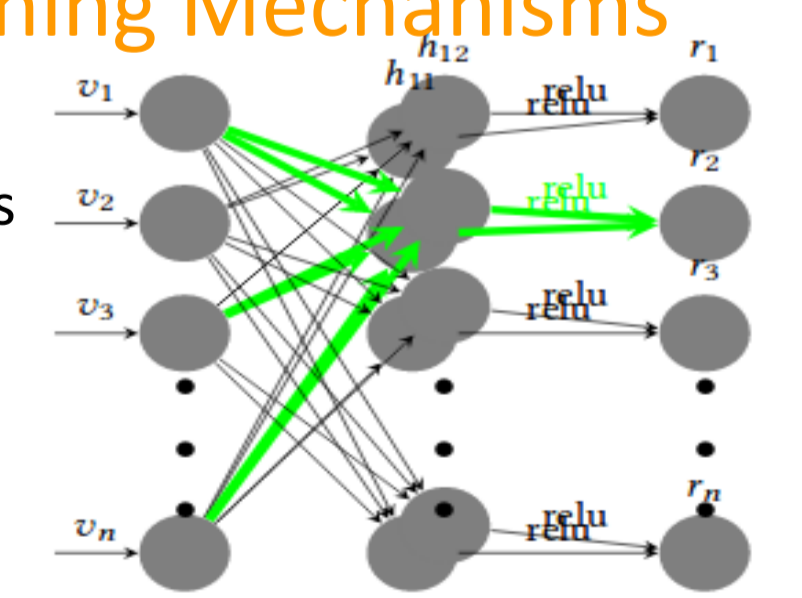
*Good afternoon. God bless you.*

*The United States will step up to the cost of a new challenges of the American people that will share the fact that we created the problem. They were attacked and so that they have to say that all the task of the final days of war that I will not be able to get this done. The promise of the men and women who were still going to take out the fact that the American people have fought to make sure that they have to be able to protect our part. It was a chance to stand together to completely look for the commitment to borrow from the American people. And the fact is the men and women in uniform and the millions of our country with the law system that we should be a strong stretches of the forces that we can afford to increase our spirit of the American people and the leadership of our country who are on the Internet of American lives.*

*Thank you very much. God bless you, and God bless the United States of America.*

## Neural Networks for designing Mechanisms

- Designing optimal linear as well as non linear Redistribution Mechanisms and Revenue Mechanisms
- Use of Reinforcement learning to model dynamic industrial environments



## Collaborators

