Requirement:

For undergraduate students, an application of techniques seen in class (or extensions of them) to some problem would be fine as a topic.
For graduate students, your topic is normally related to some research paper.

- your code,
- a README txt file that describes how to reproduce your experimental results, and
- a short report where you explain your work, emphasizing notably the difficulty and originality of what you have done.

For graduate students, you are also required to present orally the research paper and your work during our class time on 12/12. Undergraduate students should also attend to learn more about newly-developed AI techniques.
The grading will be based on the extent, difficulty and originality of your work. For graduate students, your oral presentation will also be taken into account in the grading.

Suggestion Topics:

Here are some suggestions (watch out, some of them may be hard, depending on your background). Feel free to choose something else if you'd like. You can contact me if you want to discuss the adequacy of a topic.
The goal of this project is to give you a taste of research by allowing you to explore slightly further than what is covered in class, while hopefully having fun! For project 4, you are allowed to use any library/framework/code source/language to perform your experiments.
Please post your chosen topic and the names of your teammates on Piazza by this Friday. Only one group per given topic/paper, first come first served.

*** Reasoning under certainty

Comparisons of some of the search algorithms covered in class with other methods, e.g.,
- Cross-Entropy Method
- CMA-ES

Minimax and alpha-beta pruning applied to a board game

Distributed Nested Rollout Policy for Same Game
http://www.lamsade.dauphine.fr/~cazenave/papers/NegrevergneDistributed.pdf

Alpha go or alpha zero (very hard, as we haven't covered reinforcement learning yet)

Constrained Shortest Path Search with Graph Convolutional Neural Networks
http://www.lamsade.dauphine.fr/~cazenave/papers/pathcnn.pdf

*** Reasoning under uncertainty

An Improved Admissible Heuristic for Learning Optimal Bayesian Networks
https://arxiv.org/ftp/arxiv/papers/1210/1210.4913.pdf

Discrete Bayesian network classifiers: a survey
http://cig.fi.upm.es/articles/2014/Bielza-and-Larranaga-2014-Discrete-Bayesian-classifiers.pdf

Finding Optimal Bayesian Network Structures with Constraints Learned from Data
http://url.cs.qc.cuny.edu/publications/Fan14finding.pdf

Integer Linear Programming for the Bayesian Network Structure Learning Problem
https://www.cs.york.ac.uk/aig/papers/Bartlett_Cussens_2015.pdf

Learning Bayesian Networks with Bounded Tree-width via Guided Search.
http://www.aaai.org/ocs/index.php/AAAI/AAAI16/paper/download/12054/12093

*** Machine learning

Long short-term memory
http://www.mitpressjournals.org/doi/pdfplus/10.1162/neco.1997.9.8.1735

Understanding the difficulty of training deep feedforward neural networks
http://proceedings.mlr.press/v9/glorot10a/glorot10a.pdf

Generative Adversarial Nets
https://arxiv.org/pdf/1406.2661.pdf

The Loss Surfaces of Multilayer Networks
https://arxiv.org/pdf/1412.0233

Batch Normalization: Accelerating Deep Network Training by Reducing Internal Covariate Shift
https://arxiv.org/pdf/1502.03167

Intriguing properties of neural networks
https://arxiv.org/pdf/1312.6199.pdf

Layer Normalization (2016)
https://arxiv.org/pdf/1607.06450v1.pdf

Learning to learn by gradient descent by gradient descent (2016)
http://arxiv.org/pdf/1606.04474v1

Train faster, generalize better: Stability of stochastic gradient descent
https://arxiv.org/pdf/1509.01240

Binarized neural networks: Training deep neural networks with weights and activations constrained to+ 1 or-1
https://arxiv.org/pdf/1602.02830

Professor Forcing: A New Algorithm for Training Recurrent Networks
https://arxiv.org/pdf/1610.09038

Why and When Can Deep-but Not Shallow-networks Avoid the Curse of Dimensionality: A Review
https://cbmm.mit.edu/sites/default/files/publications/art%253A10.1007%252Fs11633-017-1054-2.pdf

Understanding deep learning requires rethinking generalization
https://openreview.net/pdf?id=Sy8gdB9xx

*** Reinforcement learning (hard, as we haven't covered it yet)

Multi-armed Bandits with Application to 5G Small Cells
https://arxiv.org/pdf/1510.00627.pdf

Human Level Control Through Deep Reinforcement Learning
https://web.stanford.edu/class/psych209/Readings/MnihEtAlHassibis15NatureControlDeepRL.pdf