# Project Description

You should work on a project that is related to the themes of this class: incentives and computer science. This can range from investigating incentive issues in an existing system or that some company is facing and suggesting ways in which they can be exploited or in which the system can be improved, to building an app or website on a topic in class that you're interested in and think that there is a market for, to reading a set of papers on a topic and performing experiments or theoretical analysis to support/extend the results. We encourage you to pick a topic that you're excited about, and we're relatively flexible as long as the project is relevant to the class. You are encouraged to work in groups of 2.

# Deliverables

- (optional) Project Preferences. **Due Wednesday, January 29, 11:59 PM.**
  We highly encourage you to define your own project that is most interesting to you. However, if you prefer to use one of the example projects below, email a ranked list of all projects you'd be interested in to Anna and Aditya, who will use a randomized serial dictatorship mechanism to determine which team is assigned which project. (Results announced on January 31st.)
- Written Proposal, **Due Friday, February 7, 11:59 PM.**
  The purpose of the written proposal is to explain what you're planning on doing. The course staff will give you feedback on your proposal within a week if needed.
  Length: 1-2 pages, typed, single-space. When writing the proposal try to have a clear answer on the following questions:
  - What is the problem you are solving/studying? What are the incentive-related issues?
  - What kind of data will you use (if any)? How will you get it? Will you create it?
  - Which algorithms/techniques/models do you plan to use/develop? Be as specific as you can!
  - How will you evaluate your method? How will you test it? How will you measure success?
  - Don't forget to be creative and excited about your topic.
- In-class pitch, **During class on Tuesday, March 10.**
  - Each group will give a ~5 minute ``pitch" for their project during class. All students are required to attend these presentations. The presentation will be evaluated on clarity, and on how interesting it is.
- Final report, **Due Sunday, March 15, 11:59 PM. No extensions possible.**
  - Generally, we expect the length of the proposal to be about 8-10 pages. You will post it to piazza. The paper will be evaluated on clarity, creativity, completeness and depth. Your paper should be easy to read and not assume any background beyond what we've done in class (or what was assumed for class). Assume that the reader will have no knowledge about the topic and you are trying to give them intuition and excite them.
- Peer Review, **Due Thursday, March 19, 11:59 PM. No extensions possible.**

- Each student will read two write-ups from other groups and provide a substantial comment on the discussion board for each of these. Comments can include a discussion of points that you found unclear and why, questions about the results and methods, suggestions for further related work, citations to relevant papers, etc. Comments need not be more than about a page long (and less is okay – we're looking for quality, not quantity.)

## List of Example Projects

Below is a list of example projects to get you thinking about a project for your group. We highly encourage you to think of your own project that is interesting for you. However, if you prefer to choose one of the example projects, be sure to send your preferences to the course staff no later than **January 29**.

**Incentives for content creators**
Content platforms such as YouTube, Reddit, Wikipedia, Quora, etc. rely on the altruism of contributors for their success. Survey various incentive structures in these systems and compare their effectiveness, trade-offs, shortcomings. Come up with a creative incentive structure and devise an experiment to evaluate its effectiveness.

**Proof-of-stake systems**
Proof-of-work based cryptocurrencies such as Bitcoin and Ethereum contribute to enormous and unsustainable energy consumption. Proof-of-stake systems have been proposed to lower such energy expenditure, have better security properties, and improve transaction throughput. Survey various such systems and compare their effectiveness, trade-offs, shortcomings. Or come up with a creative proof-of-stake system and analyze its security properties.

**Decentralized oracles and prediction markets**
Prediction markets such as Augur and Gnosis rely on mechanisms that incentivize participants to share their true beliefs. In practice, these markets tend to be too thin to be of any practical use. Design mechanisms that incentivize users to participate even while enforcing honest behavior.

**Incentives in the workplace**
Organizations use a mix of monetary and non-monetary incentives to improve employee productivity. Survey various such incentive structures and compare their effectiveness, trade-offs, shortcomings. Come up with a creative incentive structure and devise an experiment to evaluate its effectiveness.

**Incentives and democracies**
Do current electoral systems encourage “good” behavior from political parties? History says no - political parties often focus their attention on swing voters (thereby taking attention away from their obvious supporters), and gerrymander districts to redistribute votes. In addition, do current legislative practices encourage elected representatives to act in the best interests of their constituents? Examine incentive issues that these systems create, and suggest changes to remedy them.

**Incentives and autonomous systems**
While we will be discussing systems with human participants, autonomous systems are increasingly more prevalent in interacting with both human beings and other autonomous systems. One common example of this are self-driving cars, who interact both with other self-driving cars and with human drivers. What mechanisms can be put in place to prevent rogue agents from abusing autonomous systems and maintaining fairness?

**Incentives and modern dating markets**
With an extremely large group of participants, dating apps are now faced with problems of congestion, noise, high search costs, and undesirable behavior. Examine the systems that have been implemented by various platforms to circumvent these problems, and the incentive issues that they create. Suggest alternative mechanisms that might address the issues you find.

**Marketplace dysfunctions**
There are many ways that marketplaces can become dysfunctional (excessive congestion, marketplace unraveling, etc). Examine a new market that is currently dysfunctional, or one that you believe will shortly become faced with such problems, and ways that those issues can be avoided.

**Study and propose a BitTorrent client better than the currently dominant ones.**
Build it if possible. Otherwise, develop a plan for justifying why and in what senses it is better.

**Speculate on incentives around driving directions in Google Maps etc.**
How do you think the algorithm works? Supply evidence backing your guess up, if possible. Are recommended routes to different people coordinated in any way? What are some possible incentive issues that could arise, depending on how the algorithm is implemented?

**Speculate on how your favorite ride-sharing company sets and changes its prices.**
Provide supporting evidence, if possible. What are some ways that you can "game the system"?

**Ways for calculating Credit Scores**
Banks often have their own way of calculating credit scores. This yields hundreds of potentially different credit scores, and presumably some of these are determined by machine learning algorithms. Do you think these algorithms can be gamed? Are there any perverse incentives, i.e., does your credit score go up by behaving in some irresponsible/undesirable way?

**Build your own App/Website**

Are you excited about any of the topics and think that there's a market for a user-friendly app (for instance, check out Spliddit, Pnyx and Robovote). You could make a prototype as your project.