

Project idea 1 : “The influence of a speed limit reduction on a traffic jam”

Traffic jam is getting more and more a problem. The number of cars is increasing every day and the time wasted stuck in traffic is annoying everyone of us. There's a lot of effort to prevent traffic jams. One notice on highways a speed limit reduction when the traffic is overloaded. We can model the effect of the speed limit reduction and see if this method improves the traffic flow. We can model a section of a fictitious two lane highway with a high traffic density. The driver model is an "intelligent driver model" . So the state of a car depends on the state of the car in the front and his driver has a finite reaction time. The driver wants to pass the highway as fast as possible, but also without any crash. So he keeps an safety distance, which depends on the velocity. If you are faster you need more safety distance. Of course the drivers have to respect the speed limit.

We would like to analyze two cases.

Case 1: There's no specific event, which causes a traffic jam. We study the influence of the speed limit on self-induced stop-and-go traffic or even traffic jams, that can suddenly appear on crowded highways. What's the ideal speed limit that allows a high traffic flow and at the same time prevents these phenomena?

Case 2: We cause a traffic jam by a specific event. For example a sudden temporary slow down of the cars due to the sun which blinds the drivers. We now reduce the speed limit at a certain point some kilometers ahead the traffic jam. Is it possible to improve the traffic flow with this method or is the traffic jam just displaced? Where is ideal point for this speed intervention and which is the appropriate speed limit?

Project idea 2 : Simulation of Trading in an artificial Stock Market

Over the past decades the financial services industry has firmly established itself as a key player in modern society. Its successes and more importantly its failures have persisted to have broad repercussions all over the world. As the heart of the financial system lies the stock market , a good analytic model of the trading of shares on the stock market could be a very useful tool to help prevent financially unfavorable situations.

The main output of the model will be a graph displaying the evolution of the transaction price of a particular stock over time. Model will contain a specific number of traders who each have a specific amount of shares and cash. a trader is randomly chosen for issuing an order. The trader can issue either a buy or a sell order with a given probability. The price of the order depends on the prices of the previous orders and eventually on the volatility of the market in the past. A transaction will occur if there is an overlap between bid and asking prices.

We can argue that:

- How does past market volatility affect the future price of a stock?
- How does the initial price/number of stocks affect future market activity?
- How does adding trader personalities affect the outcome?
- What impact does the number of stocks per transaction have on the market?

Project idea 3: Friendship Social Network and Alcohol Use

According to the National Survey on Drug Use and Health, 58% of full-time college students aged 18–22 drank alcohol in the past month, 37.9% reported binge drinking and 12.5% reported heavy alcohol use in the United States. more than 150,000 students developed an alcohol-related health problem each year. Friends are key to whether, when, and how much adolescents drink alcohol and are also central to prevention . Until very recently, however, the relationship between friendship network and alcohol use has not been studied empirically. Using various data we can apply different statistical methods to understand how friendship network and alcohol use are connected in the hope to find ways to better prevent alcohol abuse among college students.

Since CSS is **computational methods and approaches to study the social sciences** . By the above point we can say Above projects are of CSS type.