

# Project Ideas

Seminar: Norbert Wiener's Cybernetics

October 11, 2023

## 1 Adaptive User Interfaces

Design a user interface that adapts to user behavior over time, optimizing for user preferences and habits. This could involve tracking user interactions, making predictions, and dynamically adjusting interface elements.

## 2 Cybernetic Music Generator

Develop a program that creates music based on feedback from listeners. Aspects such as tempo, pitch, or rhythm could change based on user inputs or preferences. This project could blend algorithmic composition with interactive elements.

## 3 Predictive Text Systems

Build a simple predictive text system using machine learning or heuristic algorithms. Dive deeper into how these systems make use of past data (feedback) to predict future inputs.

## 4 Smart Home Simulation

Create a simulated smart home environment where devices communicate and adjust based on user behaviors and other device inputs. For example, lights that adjust based on time of day and user location or heating systems that change based on occupancy and external temperature.

## 5 Behavior-Based Robotics

Using a robotics simulation platform, design robots that exhibit behaviors based on environmental feedback. Instead of pre-defined paths or actions, robots would react based on sensors and surrounding conditions.

## 6 Cybernetic Optimization Algorithms

Implement optimization algorithms that adaptively change their parameters based on the feedback from previous iterations. This could be applied to problems like function optimization, traveling salesman, etc.

## 7 Web Traffic Load Balancing

Create a simple simulation of a load balancer for web traffic. The system would distribute traffic based on server load and health, showcasing feedback and adaptive response in action.

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## 8 Reinforcement Learning Playground

Set up a basic reinforcement learning environment where agents learn from feedback. Students could explore different reward structures and observe how agent behaviors change over time.

## 9 Sentiment Analysis Feedback Loop

Design a system that performs sentiment analysis on user comments or reviews. Based on the sentiment detected, the system could adjust certain parameters (like content recommendations) in real-time.

## 10 Ecosystem Simulator

Create a simulation of a natural ecosystem where different species interact. Incorporate feedback loops such as predator-prey dynamics, and see how changing initial conditions or parameters affects the overall system stability and biodiversity.

## 11 Feedback Loop Visualizer

Using a simple graphical interface (such as with Python's tkinter or web-based platforms), students create a dynamic visual representation of a feedback loop. A simple example: A thermostat display where the user changes the room temperature, and the system reacts.

## 12 Simple Chatbot with Feedback

Develop a chatbot (using basic decision-tree logic, not ML) that changes its responses based on user feedback. Example: A coffee recommendation bot that suggests different coffee types and adjusts its future recommendations based on user likes or dislikes.

## 13 Temperature Control Simulation

A basic program that simulates temperature control in a room. The program can graphically display temperature fluctuations, and students must implement the logic to stabilize it. Example: The room gets warmer or colder randomly, and the student's logic must react to keep it stable.

## 14 A Cybernetic Crossroads with Traffic Lights

Create a real-time traffic light control system that employs cybernetic principles. Your system should analyze traffic conditions and adjust signal timings accordingly, forming a dynamic feedback loop to optimize traffic flow in a simulated urban setting.

## 15 Traffic Simulation and Braess's Paradox

Construct a simulation that replicates a transportation network and introduce changes in road infrastructure or traffic rules to observe how they can paradoxically worsen traffic congestion. This effect is known as Braess's paradox and can offer a valuable lesson in urban planning and systems dynamics.