# Course Outline

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## Structure

Two 5-hour days: 2 hours session, lunchbreak, 3 hours session; for each day.

Prerequisites: we will alternate between presentations and programming exercises. The programming exercises are not required, but require use of a laptop with Python 3 installed. Experience in Python would be very helpful. If you don’t have these skills, you could pair up with someone who does.

We will also be using a number of concepts of probability, statistics, and linear algebra.

## First Day

### Introduction

What do we mean by intelligence? What do we mean by artificial intelligence?

Examples of AI

What are the primary concepts and approaches used in AI?

### Problem Solving

Solving problems by searching

Informed search methods

Game Playing

### Programming Example: Problem Solving

What tools and languages are commonly used?

Python

magic square example

Sudoku example in Python

### Knowledge and Reasoning

What is knowledge?

First-order logic

Building a knowledge base

Inference in first-order logic

Logical reasoning systems

### Programming Example: Knowledge and Reasoning

Rule-based systems

github, a simple rule based engine

sources.washington.educdd482/examples/animal.clp

### Uncertain Knowledge and Reasoning

Uncertainty

Making simple decisions

Making complex decisions

### Programming Example: Uncertainty and Reasoning

Bayesian inference

### Data Science

Definitions

Examples

### Guest Presentation by Jenny Cai, Data Scientist at Moxie

This talk will cover typical projects carried out by Data Scientists.

## Second Day

### Machine Learning

Learning from observations

Gradient Descent (chapter 4 of hands on ML book)

Learning in Neural and Belief Networks (chapter 20 of Peter Norvig’s book)

Reinforcement Learning

### Programming Example: Learning from data

Programming in Python Notebooks

Scikit-Learn

Linear Regression - fit and predict

housing price - chapter 2 of scikit learn book

neural network train and predict

### Deep Learning/Neural Networks

Definitions

Why are these the current hot topic?

Back-Propagation

First set of examples - MNIST digits,

Structure of Neural Networks

Second set of examples

### Programming Example: Deep Learning

TensorFlow and other libraries (MXNET)

Programming linear regression in TensorFlow - p235 of scikit books

Keras and other frameworks

Multi Layer Tensorflow model

### Specialized Types of Neural Networks

CNN’s for images

RNN’s for time series data

### Programming Example: CNN’s and Images

Using TensorFlow for digit recognition

Using TensorFlow for animal image classification

### Guest Presentation from Utkarsch Contractor, Head of AI and Data Science at Aisera

This talk will focus on language and text processing

### Conclusions

Current applications of AI

Reading list for further investigation

Objectives:

1. Understand the kinds of problems AI can be applied - any problem that humans can solve in 5 minutes given some domain knowledge will be assigned to AI. Recommend a book given my previous favorite book. Recommend which credit card to select at a bank given your payment history and level of usage. Schedule a maintenance activities on your car, such as cleaning, repairing, or changing oils. Suggest and schedule a unique travel destination according to your travel interest. Identify what’s wrong with your computer network. Select glasses based on prescription history and a variety of measurement. Diagnose diabetes given retina images.
2. These technologies are learnable. Make students become fascinated about them.
3. Hands on
4. Approach to learning these technologies