# Course Outline

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## Structure

Two 5-hour days: 2 hours session, lunch-break, 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

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

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