361 Week 2

Lecture 1 {

Definition of AI {

Field that studies the synthesis and analysis of computational agents that act rationally

Definition of Computational Agent = Agent whose decisions and actions can be explained in terms of co mputation

Definition of Agent = Something that acts within an environment
}

Goals {

Scientific vs Engineering Goals

Uses general scientific approach

Focuses on empirical systems not applications

}

Benefits {

Business and Social

Business
Process Automation
Enhance creative tasks
Increased accuracy
Better predictions and improved decisions

Social
Healthcare
Smart cities
Forecasts and predictions
Agriculture
Overall Lifestyle
}

Risks {

Safety and Security
Trust and Social Manipulation
Explainability
Job Loss
Accountability
Accuracy, bias, privacy and inequality
Human biases and prejudices
Technological Social Responsibility

}

Features in Machine Learning {

Machine Learning models dependent on data
Machine Learning algorithms designed to understand numbers

Feature = Individual measurable property or characteristic of a phenomenon being observed
A set of features represent the information you can draw from data

Label = Tag you wish to assign to a set of features

Feature Vector = Numeric | Symbolic characteristics called features of an object in a mathematical analysable way

Training:

Data -> Features and Labels -> Machine Learning Algorithm -> Predictive Model

New:

Data -> Features Vector -> Predictive Model -> Expected Label
}

Feature Extraction {

Definition = Set of methods that map input features to output features

Any technique that transform raw data into features that can be used as input to a learning algorithm

Process of transforming raw data into numerical features that can be processed while preserves the information in the original data set

Raw Signal - > Preprocessing -> Features Extracted -> Classifier -> Output

Learning algorithms prefer numeric data
Real World data is often non-numeric
Real World data mostly unstructured
Increase learning accuracy by extracting most significant features

Approaches {

Manual:
Manually identifying and describing relevant features
Requires knowledge

Automated:
Uses specialised algorithms with no human intervention
More efficient

}

Feature Vector = Collection of features and their labels | New encoding of image

Feature Extraction from Images {

Detects and represents the interesting parts of an image as a compact feature vector
Critical step in image processing and computer vision

}

Good Feature {

+ Repeatable
Should be detectable at same location in different images despite changes in viewpoint and illumination

+ Saliency
Descriptive
Same points in different images should have similar features

+ Compactness
Affect speed of matching
Fewer and smaller features are best

}
}
}

Lecture 2 {

Image = Array of Pixels

Pixel Values can be extracted as feature vector representation for images

Real World <=> Computations

Real World : Continuous Space
-Infinity to Infinity
Theory

Computations : Discrete Space
Grid
Practice

Computer Vision Theory:
View Image as Function
u: Z x Z -> R = pixel rows and columns -> intensity values

View Video as Function
u: Z x Z x Z -> R = pixel rows and columns, frame -> intensity values

mesh(im(:,:,1))

Edge Detection: Curve that follows a path of rapid change in image intensity
Used to identify edges in an image
Canny filter is best known => Gradients

```
 // TODO:

 CW = Create Edge Detector

 Fully zoned out for the rest sorry bro
}
```