Concerning Project Dædalus

A Brief Analysis

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Bachelor of Science in Mathematics Computer Science (Hons), 2020
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Further Education — A La Carte

- California Institute of Technology
- Columbia University
- Dartmouth College
- Delft University of Technology
- Harvard University
- Indian Institute of Technology, Bombay
- Imperial College London
- London School of Economics and Political Science
- Massachusetts Institute of Technology
- Stanford University
- Amazon Web Services
- Arm Education
- Google
- IBM
- Microsoft
- International Monetary Fund
- Linux Foundation
- World Wide Web Consortium
- World Bank

Abstract

Enable an easily reproducible, people-agnostic workflow and thus consistently enforce brand awareness with customised, ever improving aesthetic.

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Architectural Visualisation

Definition — Architectural Visualisation

The art of generating realistic 3D visualisations (renders) of buildings, interiors, landscapes, and other designed environments using specialized software.

Computer Aided Design

Definition — Computer Aided Design

Computer-aided design (CAD) is the use of computers (or workstations) to aid in the creation, modification, analysis, or optimization of a design.

Definition — Design

A design is a plan or specification for the construction of an object or system or for the implementation of an activity or process or the result of that plan or specification in the form of a prototype, product, or process.

Building Information Modeling

Definition — Building Information Modeling

Building information modeling (BIM) is a process involving the generation and management of digital representations of physical and functional characteristics of places.

Traditional Workflow

Traditional Workflow Definition

Modeling Software[1] $\rightarrow$ Rendering Engine — Visualisation $\rightarrow$ Presentation

[1] Modeling Software can be either CAD or BIM; nowadays mainly BIM

Tradition Workflow Level Classifiers

- Basic
- Intermediate
- Expert
- Trends

Tradition Workflow Level Classifiers — BASIC

Traditional Workflow Template

Modeling Software → Rendering Engine — Visualisation → Presentation

Traditional Workflow Template: Classifier Level: Basic

archicad — vectorworks — revit → enscape — d5 render — twinmotion → Indesign — Illustrator — Photoshop

Tradition Workflow Level Classifiers — INTERMEDIATE

Traditional Workflow Template

Modeling Software → Rendering Engine — Visualisation → Presentation

Traditional Workflow Template: Classifier Level: Intermediate

3Ds Max — Sketchup — Blender — Rhino → v-ray — corona — lumion → Indesign — Illustrator — Photoshop

Tradition Workflow Level Classifiers — EXPERT

Traditional Workflow Template

Modeling Software → Rendering Engine — Visualisation → Presentation

Traditional Workflow Template: Classifier Level: Expert

3Ds Max(Railcone, Forrest Pack) — Sketchup(Curviloft) — Blender(BlenderBIM, DIY) — Rhino(Grasshopper) → v-ray — corona — lumion → Indesign — Illustrator — Photoshop — Premiere Pro — After Effects

N.B.: Extend workflow with plugins, pay close attention to composition, use physically based rendering(pbr) materials.

Trends

Artificial Intelligence:

via an Implementation of Stable Diffusion

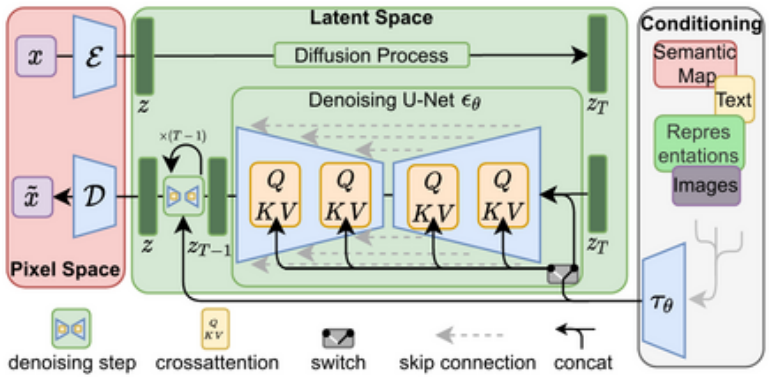
Generative Artificial Intelligence:

via an implementation of stable diffusion while at the same time employing recursive prompt engineering to emulate auto-dictating capabilities

Elaboration

Definition — Stable Diffusion

Stable Diffusion is a deep learning, text-to-image model. Stable Diffusion is a latent diffusion model, a kind of deep generative neural network. Stable Diffusion consists of 3 parts: the variational autoencoder (VAE), U-Net[2], and an optional text encoder.



[2] A type of convoluted neural network

Elaboration

Definition — Generative Artificial Intelligence

- Glorified Prompt Engineering
- System describes input and provides a list of modifiers
- Safe sandbox for experimentation; rather limited

Conclusion

Stable diffusion via generative artificial intelligence $>$ Stable Diffusion There are some pitfalls:

- Non-reproducible renders; unless seed based and then only in 2-D
- Only 2-Dimensional

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Literature Review

All of the research related material will be made available once the core components of the software become open-source. At that point it should become available to read at `https://arxiv.org`

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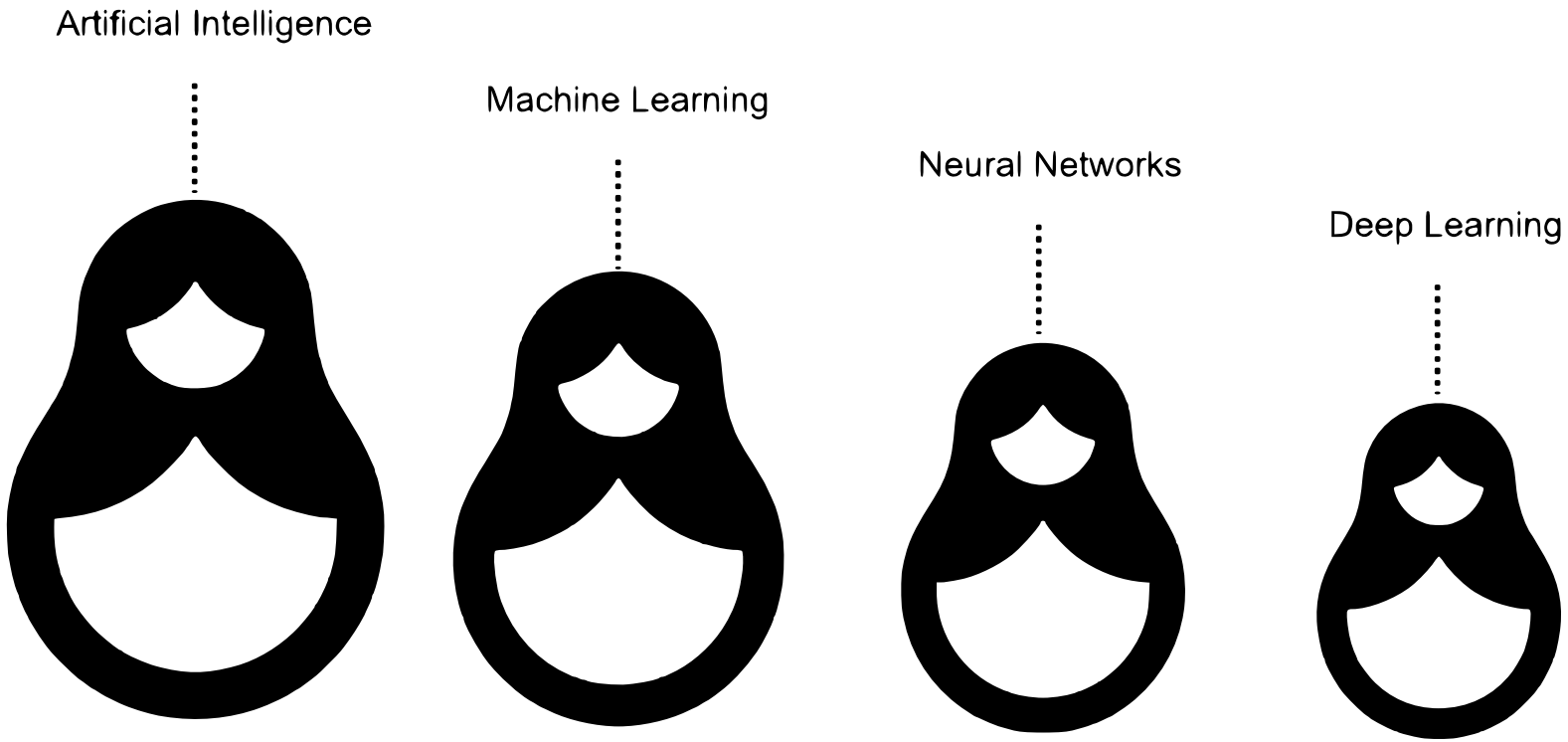
Vernacular — Technical Jargon

Common Misunderstanding

Artificial Intelligence Vs Machine Learning Vs Neural Networks Vs Deep Learning



$\therefore$ *ArtificialIntelligence* $\supseteq$ *MachineLearning* $\supseteq$ *NeuralNetworks* $\supseteq$ *DeepLearning*

Artificial Intelligence

Definition — Artificial Intelligence

Artificial intelligence (AI) is the broadest term used to classify machines that mimic human intelligence. It is used to predict, automate, and optimize tasks that humans have historically done, such as speech and facial recognition, decision making, and translation.

Machine Learning

Definition — Machine Learning

N.B.: Essentially a prediction model

- Decision Process; the model needs to make a prediction
- Error Function; whether the prediction was correct
- Model Optimisation Process; a function that improves the prediction rate based on a training set and assigned weights.

Neural Networks

Definition — Neural Networks

$\sum_{i=1}^{m} w_i x_i + bias = w_1 x_1 + w_2 x_2 + w_3 x_3 + bias$ where:

- x : *input*
- w : *weight*

Deep Learning

Definition — Deep Learning

- scalable machine learning
- automated input handling dataset creation
- consists of minimum 3 layers deep neural network

System's Architecture

The architecture essentially implements a piece of software that:

- accepts a 2 dimensional floor plan, submitted in plan view
  - analyses the floor plan using a computer vision algorithm
  - generates a shape storage map
  - extrudes relevant meshes in 3 dimensions
- accepts geographic coordinates, submitted under standard geographic coordinate system
  - models relevant terrain around point-of-interest
  - implements more realistic lighting conditions
  - implements more realistic weather conditions
- exhibits auto-dictating capabilities due to the euristic nature of neural networks; the more the software is used the better the results will be

Competitive Edge

Compared to the competition:

- time saving techniques
- better results
- atomic, ephemeral reproducible results
- 3-D results; a lot more freedom

Personal Background

CEO of a private company Provided Services Include:

- Software Engineer
- System's Architect
- Platform Engineer; experience with real time, heavy load and stress related deployments of financial corporations;

Can thus guarantee:

- General Data Protection Regulation Compliance; we store no sensitive information; your projects are safe with us
- extensive security; NSA compliant cluster deployment via `https://media.defense.gov/2022/Aug/29/2003066362/-1/-1/0/CTR_KUBERNETES_HARDENING_GUIDANCE_1.2_20220829.PDF`

Recap: Abstract

Enable an easily reproducible, people-agnostic workflow and thus consistently enforce brand awareness with customised, ever improving aesthetic.

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Human Touch

- custom dataset for each customer
- consistently custom feel for all renders
- plethora of output styles
  - emulate an artist
  - have a designer/team create one for you and then train the algorithm to replicate it
  - pick one: diagram, sketch, realistic, stylised
  - plethora of viewpoints and perspectives to choose from

Samples

Replicating Ingels

Samples

Replicating Zunthor

Samples

Interactive Model