Artificial Intelligence
Final Project Presentation

Class: IBM IMVAI-2202

Team: 2

Team Members:
Yip Shih Herng,
Tan Kaeh Choy (Richard),
Soo Wan Sen,
Lim Tze Siang (Alan) &
Fang Zixin (Eunice)

Agenda

Vince Soo	**Cheesy story-telling (Introduction)** **Enterprise Design Thinking** **Project Planning**
Alan Lim	**A.I Lifecycle ~** **(Intent, Data, Understanding,** **Reasoning & Knowledge)**
Richard Tan	**Architecture Design** **Live Demo**
Eunice Fang	**Chatbot Development**
Yip Shih Herng	**Summary & Reflections**

Introduction

Project Topic – Cheese

The production of cheese predates recorded history, beginning well over 7,000 years ago.Humans likely developed cheese and other dairy foods by accident, as a result of storing and transporting milk in bladders made of ruminants' stomachs, as their inherent supply of rennet would encourage curdling.

When things curdle, **they turn from liquid gradually to solid, forming clumps along the way**. If you leave milk out of the refrigerator long enough, it will curdle. When a liquid curdles, it forms curds, or lumpy solid masses. In some cases this is deliberate, as when you make cheese or tofu.

2,191 Curdle Images, Stock Photos ...
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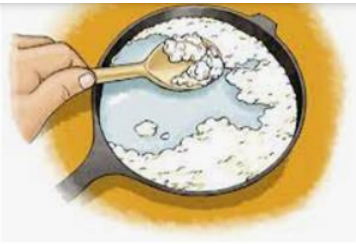

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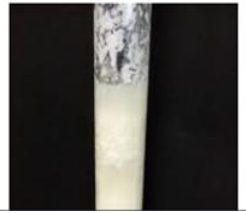
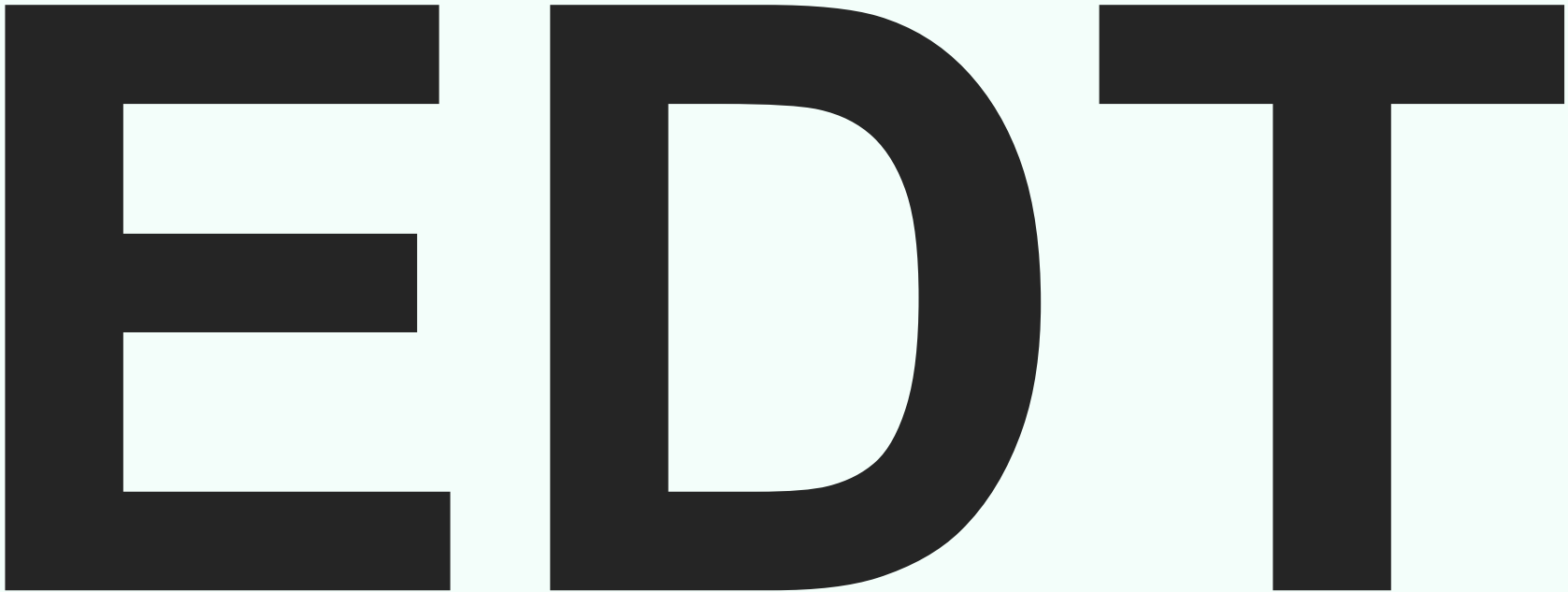



EDT

Business Understanding

★ What is the business problem?

Too many types of cheese not enough knowledge

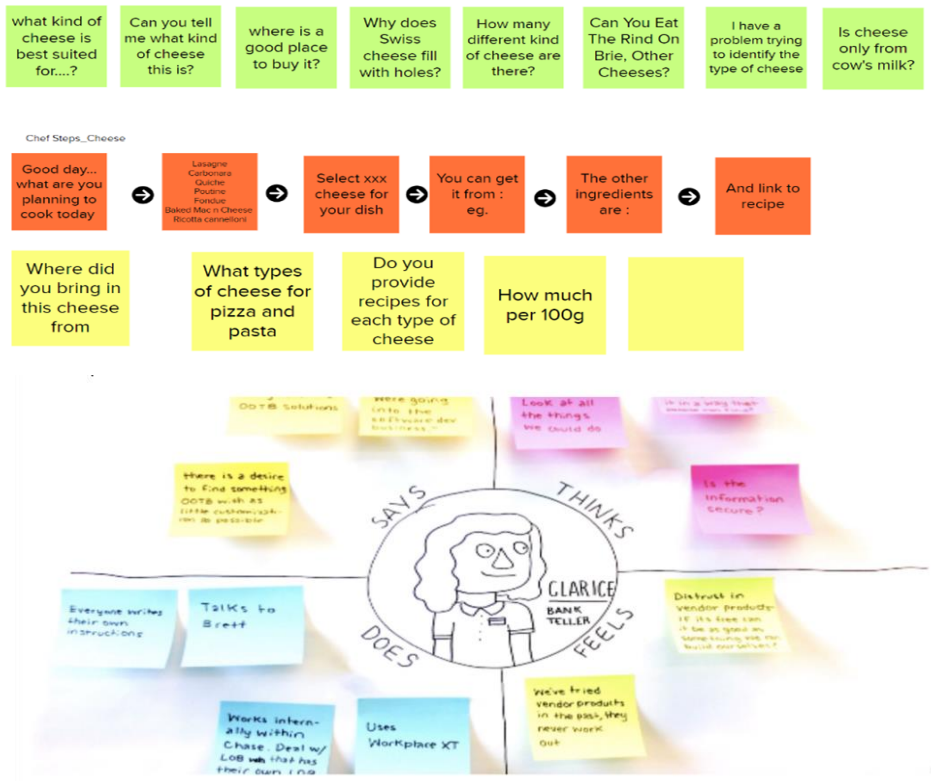
★ What is the business opportunity?

Provide recipes for various types of cheese

Ideation


Busy housemakers, shoppers
Improve on the knowledge of cheese and shopping experience
making the selection of cheese easier for preparation of meals
Housewife
improve cheese knowledge
so that consumption of cheese will increase
How a shoping mall
able to locate the car llc plate no. in its carpark
so as to help the authority with the identification
How might we differentiate types of cheese
for the regular supermarket shoppers
who just need to find the right cheese for their dishes within seconds
Housewife ccooking for family
Sellect the right type of cheese
able to cook a nce dish with a qucik n easy guide

Empathy Map


what kind of cheese is best suited for....?
Can you tell me what kind of cheese this is?
where is a good place to buy it?
Why does Swiss cheese fill with holes?
How many different kind of cheese are there?
Can You Eat The Rind On Brie, Other Cheeses?
I have a problem trying to identify the type of cheese
Is cheese only from cow's milk?
Chef Steps_Cheese
Good day... what are you planning to cook today
Lasagne
Carbonara
Quiche
Poutine
Fondue
Baked Mac n Cheese
Ricotta cannelloni
Select xxx cheese for your dish
You can get it from : eg.
The other ingredients are :
And link to recipe
Where did you bring in this cheese from
What types of cheese for pizza and pasta
Do you provide recipes for each type of cheese
How much per 100g
SAYS
THINKS
DOES
FEELS
CLARICE
BANK TELLER
Look at all the things we could do
Is the information secure?
Talks to Brett
Uses Workplace XT
Says
Thinks
Does
Feels
Too many types of cheese to choose from
unsure about what cheese is suitable with different kinds of food
Getting my family interested in the dishes that i prepare
needs inspiration for new dishes
Does not have the expertise to make a dish with cheese
Want to venture to other dishes other than chinese
Knowledge of Cheese is limited
recipe samples will be of great help
How to differentiae the types of cheese
How can I save time by choosing the correct type of cheese with a recipe provided
how to create new interesting dishes for my kids
Difficult to understand the different types of chesses
Think good to have a website to help identify the type of cheese and where to buy it
try out different recipes
Search thr' cook books
As an appetiser
Mix in salads
Roast on toast
Asking friends and colleagues
Shredded cheese topping on pizza
Steam with eggs
Spread on bread
For baking cakes
not inspired to cook with cheese
discouraged if family dosent like the cheese inspired dish prepared
frustrated if cant find a particular type of cheese
Too many types of cheese
Sliced cheese are not real cheese
Lack of knowledge and recipes
Sometimes forget which cheese for what dish
Some cheese are expensive
No confident as never done before
Feel frustrated of not able to get the kind of relevant information

Persona

Name Sally

Profile

Age	39
Location	Singapore
Education	Degree
Job	Housewife
Family	
Work experience	
Technical literacy	

Motivations

- To be a better cook
- Enjoy cooking for family
- Having the knowledge of the diff kind of cheese

Goals

- Eat sleep shit cheese
- To ccok a variety of dishes
- Able to identify the cheese type

Needs

- Know all about cheese
- Able to identify ingredients for cooking a healthy meal
- For cooking and teaching

Pain Points

- Difficult to identify different types of cheese
- Where can I find recipes for cheese
- Who Moved My Cheese


How might we
improve the shopping experience
for
shoppers/homemakers/inspiring chefs
so that
they can increase their cheese knowledge, get inspiration for meal preparation and make the proper selection of cheese for their dietary needs

Business Objectives

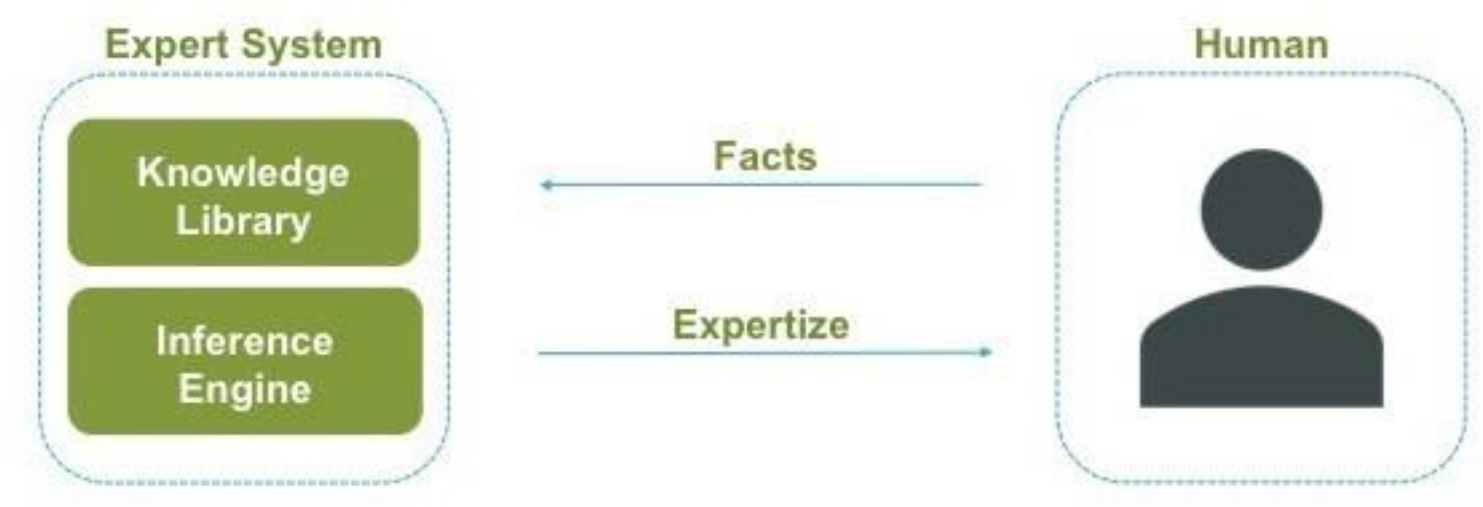
“ *How to identify the different types of cheese & the available recipes for them* ”

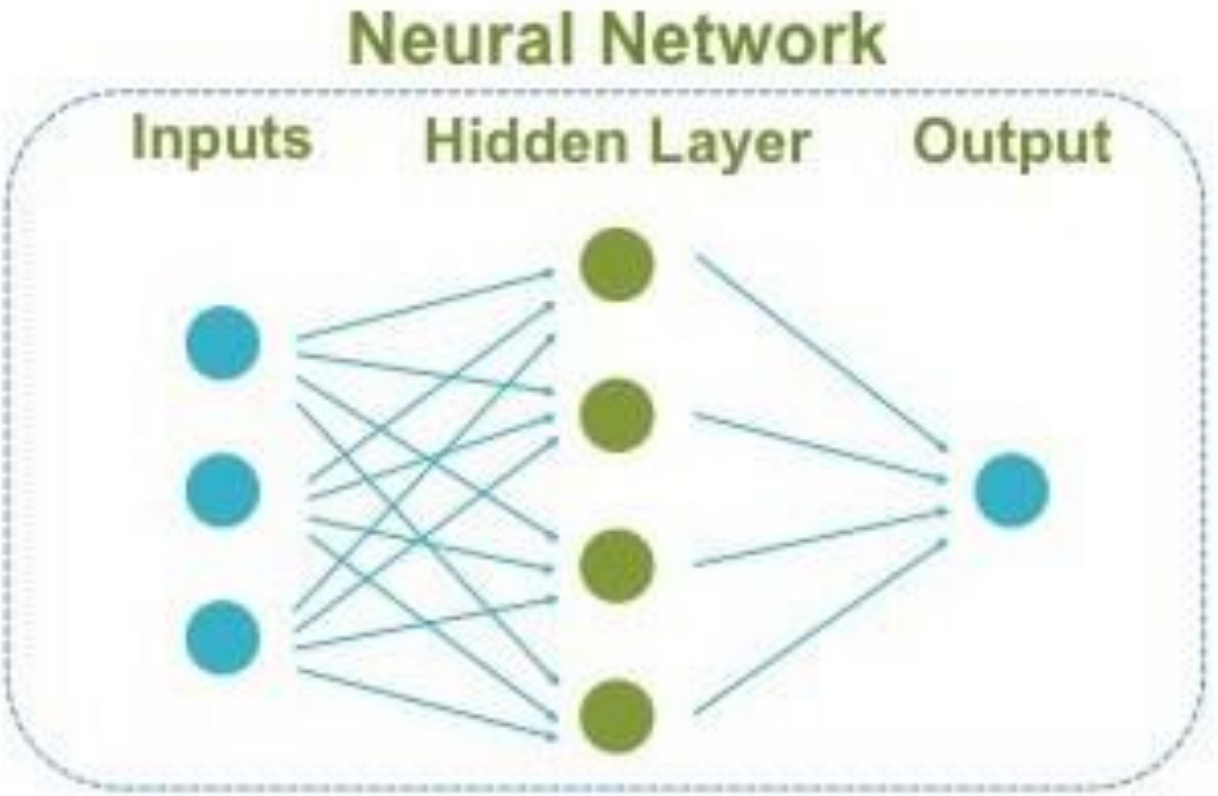
PROJECT PLANNING

Which AI approach is best for helping with project planning?

Intelligence (ANI)-based. ANI, also referred to as Weak or Applied AI, is a type of AI that specializes in one area.

Our implementation of ANI-based AI can be classified into two categories: expert systems and neural networks.




Neural Network
Inputs
Hidden Layer
Output

AI Concept

- Expert (Knowledge-Based) Systems
  - Knowledge base + inference engine
  - Rule-based e.g. IF…AND…THEN…
  - Domain-specific e.g. planning
- Neural Networks
  - Learn by example/pattern e.g. face recognition
  - Not task (domain) specific
  - Requires history or supervised learning

- InEight Basis Expert System
  - Captures cost, schedule, risk, CPM data
  - Makes planning suggestions based on rules
  - Doesn't require 'big data'
- InEight Basis Neural Network
  - Uses Machine Learning to get smarter
  - Automatically adjusts 'weighting' of each rule
  - Results in higher confidence suggestions

Practical Application of AI

Minimum Viable Product

We created a WikiChat, we call it **CheesyBot**

e.g. Who like to choose the cheese with a chatbot

e.g. Chatterbox can be cheesy with a chatting-bot

Project Timeline

Date	Description
29 August 2022	Team Discussion - Mural
30 August 2022	Team Discussion - Mural and EDT
1 September 2022	Team Discussion - First draft chatbot
2 September 2022	Midpoint Project Discussion
5 September 2022	Team Discussion - Project Integration
6 September 2022	Team Discussion - Project Integration
7 September 2022	Team Discussion - Chatbot completion
8 September 2022	Team Discussion - Project review
9 September 2022	Team Discussion - Project review and rehearsal 1
10 September 2022	Team Discussion - Project review and rehearsal 2
12 September 2022	Final Project Presentation & Submission

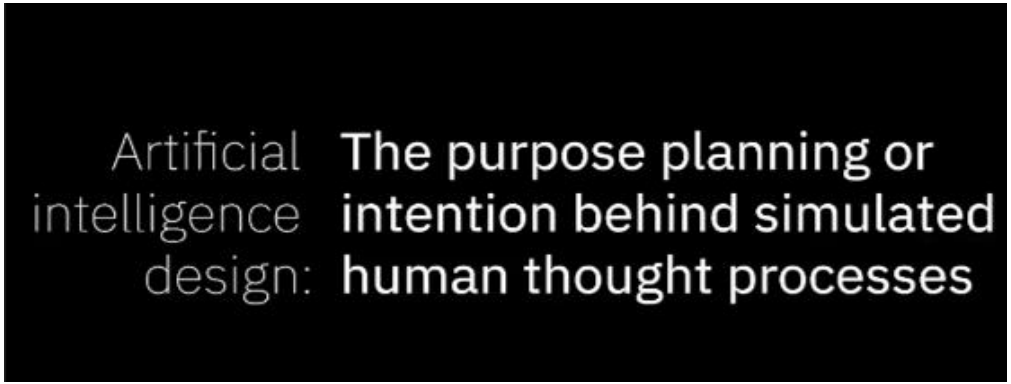
Team Members’ Task Allocation

Team Member	Task Allocation
Soo Wan Sen (Vince)	EDT, AI Essential Lifecycle, PPT preparation
Alan Lim Tze Siang	EDT, AI Essential Lifecycle, PPT preparation
Fang Zixin Eunice	EDT, AI Essential Lifecycle, Chatbot Development, Architecture Design, Summary & Reflection, PPT preparation
Yip Shih Herng	EDT, AI Essential Lifecycle, Chatbot Development, Architecture Design, Summary & Reflection, PPT preparation
Richard Tan Kaeh Choy	EDT, AI Essential Lifecycle, Chatbot Development, Architecture Design, Summary & Reflection, PPT preparation

Technical Planning & Consideration

Tools

- Mural
- Kaggle
- Heroku
- Github
- IBM Watson Assistant

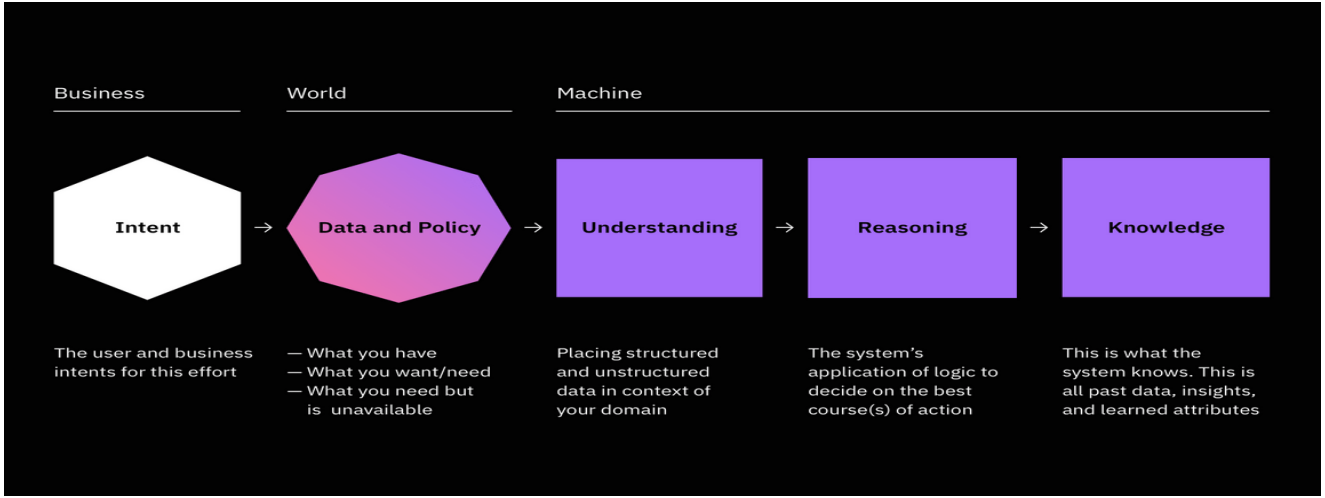


A.I Essentials Framework

A.I Essential Framework - The 5 Focal Points

- ***INTENT***: Align on the business and user(s) for your solution.
- ***DATA***: Document the data you could use to make your idea a reality.
- ***UNDERSTANDING***: Determine what you will need to teach your AI.
- ***REASONING***: Bring your ideas down to earth.
- ***KNOWLEDGE***: Brainstorm the direct and indirect effects of your AI

.



A.I Essentials
Intent

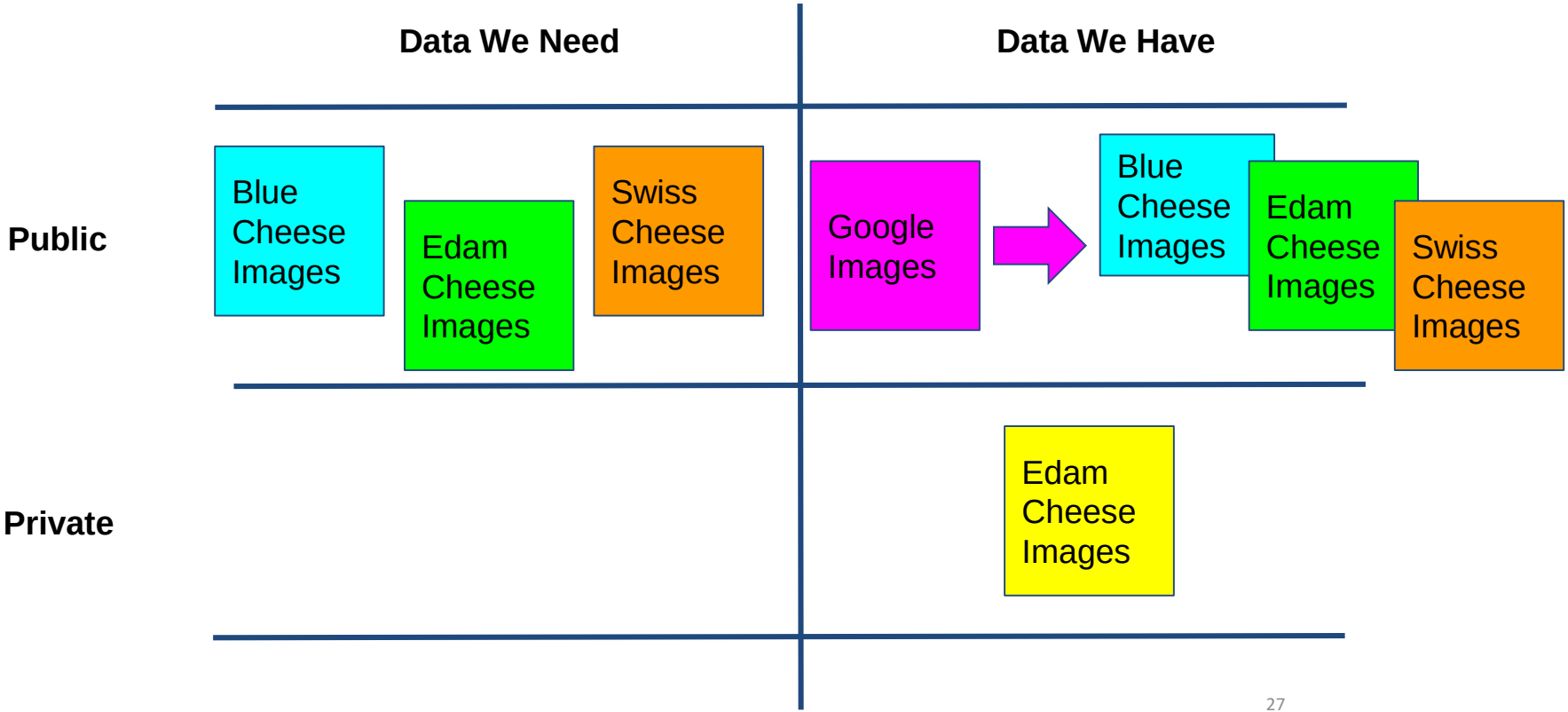
A.I Essentials - Intent

The 6 core AI intents

- **Accelerate research and discovery**
- Enrich your interactions
- Anticipate and preempt disruptions
- **Recommend with confidence**
- Scale expertise and learning
- Detect liabilities and mitigate risk

A.I Essentials
Data

A.I Essentials - Data



A.I Essentials
Understanding

A.I Essential Framework - Understanding

What is Understanding?

Understanding is the process of putting incoming unstructured and structured data in context of the domain, which is also known as machine learning.

How does this particular principle apply to our project?

In order to help our AI understand, we picked what we are going to train our AI with the data we came up with earlier.

To do this, we will need to break down what is available - What are the data's components? What kind of terminology is used?

A.I Essentials
Reasoning

A.I Essential Framework - Reasoning

Finding meaning through reasoning

[Business] can [intent] by [big idea] based on [the AI's data and understanding]

Cheese distributors can provide useful knowledge and recipes to consumers about different types of cheese via online consultations with our **Cheesybot**

A.I Essentials
Knowledge

A.I Essential Framework - Knowledge

- Accountability
- Value Alignment
- Explainability
- Fairness
- User data rights

A.I Essential Framework - Knowledge

The need to consider the direct and indirect effects of AI systems :

1. Need to consider culture and value systems
2. Understand and reflect on users values
3. Align AI actions and intents
4. Meet Singapore PDPA requirements.

A.I Essential Framework - Knowledge

Actions to Take :

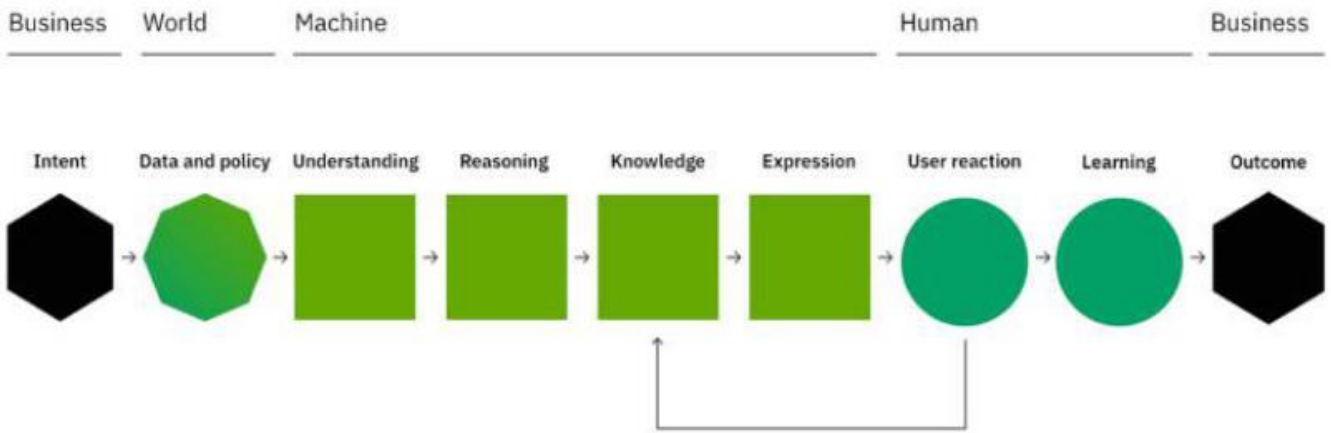
1. Eliminate bias
2. Feedback mechanism
3. Protect data rights

A.I Essential Framework - Outcome

The below diagram illustrates the visualization of context in an AI design process according to the AI/Human model. The user's reaction is closely tied to machine's knowledge which is part of the framework.

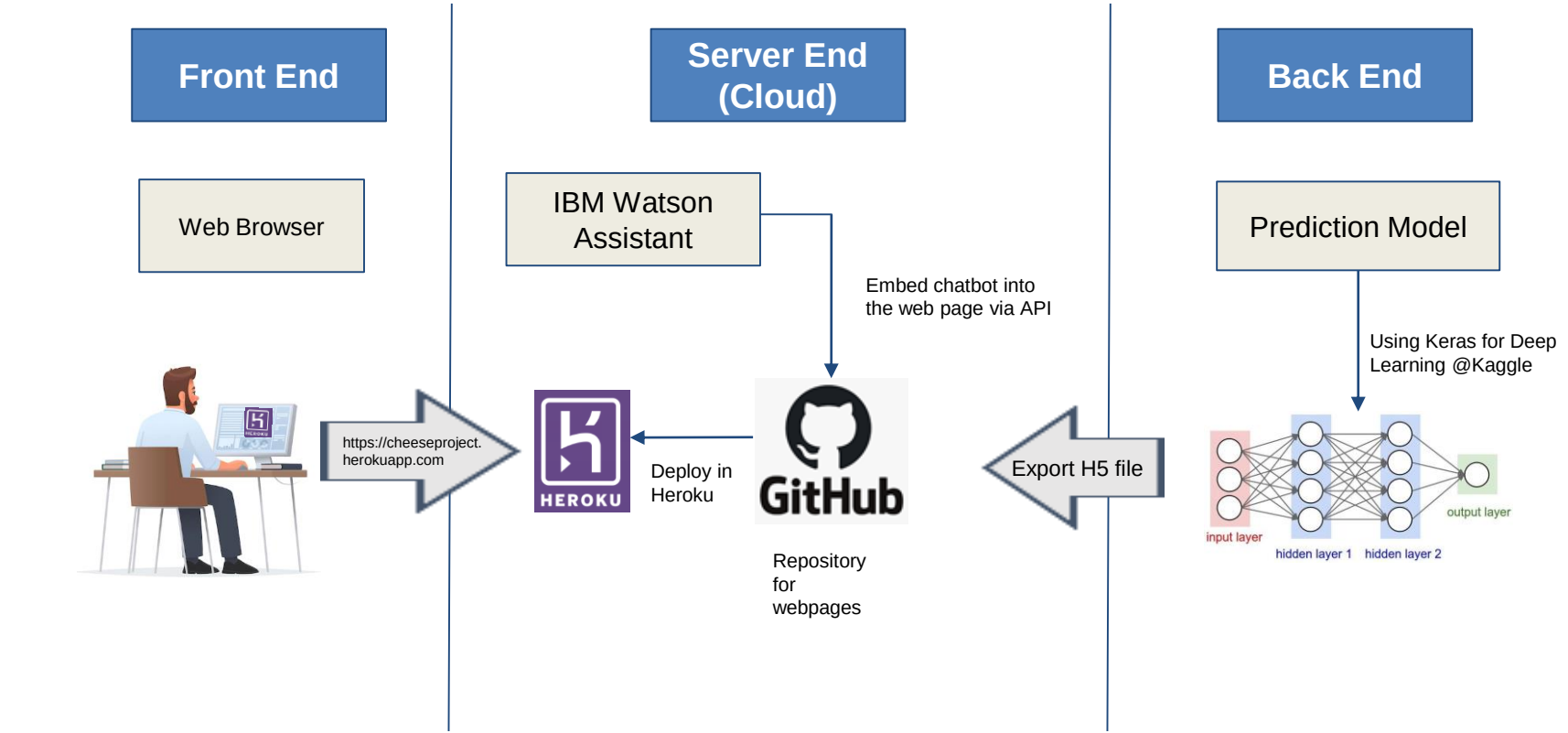
Final Outcome

After we finished applying the AI essential Framework, the outcome should be a sturdy foundation to facilitate the design of a human-centred and relevant AI system.

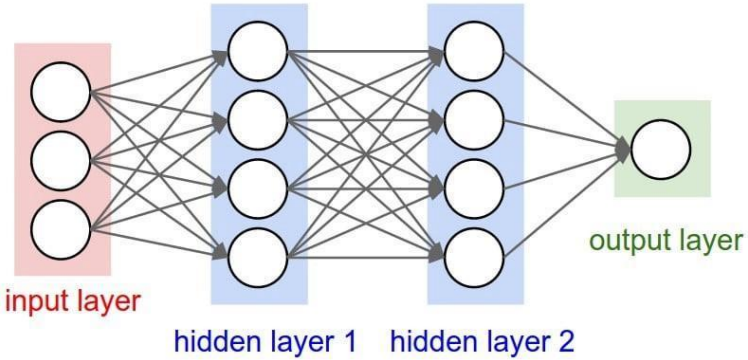


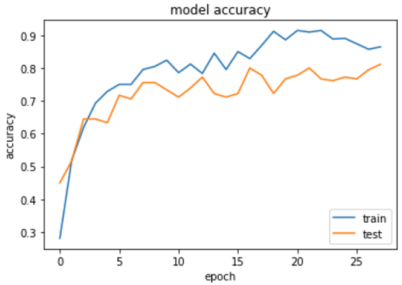
Architecture Design

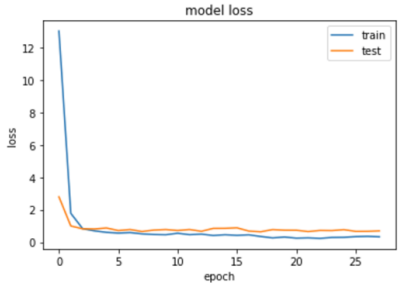
Architecture Design (Overview)



Architecture Design - Back End (Model)







- Keras for Deep Learning in Kaggle.
- Two hidden layers and an output layer.
- Hidden layer with 1024 units
- EarlyStopping thr' Keras.callbacks
- Dropout technique

- accuracy: 0.8643
- val_accuracy: 0.8111

- loss: 0.3297
- val_loss: 0.6947

Architecture Design - Back End (Data)

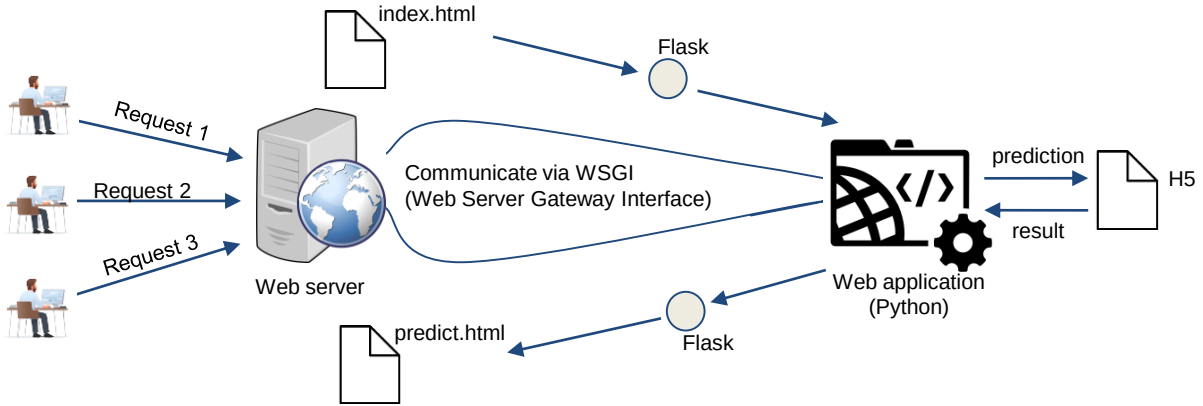
	Blue Cheese 	Edam Cheese 	Swiss Cheese 
Test Set	60	60	60
Training Set	140	140	140
Total	**200**	**200**	**200**
Deployment Test Set	10	10	10

Architecture Design - Server End (GitHub)

Procfile `web: gunicorn app:app`	A text file in the root directory to explicitly declare what command should be executed to start the app. Syntax: `<process type>: <command>` Gunicorn - a Python Web Server Gateway Interface (WSGI) HTTP server.
app.py `app = Flask(__name__)`	A Python file render by Flask framework.
index.html	The landing page where the user will see and able to upload cheese image file for classification.
predict.html	The Classification page where the result will be displayed.
requirements.txt	The apps/libraries needed.

Architecture Design (Flask)

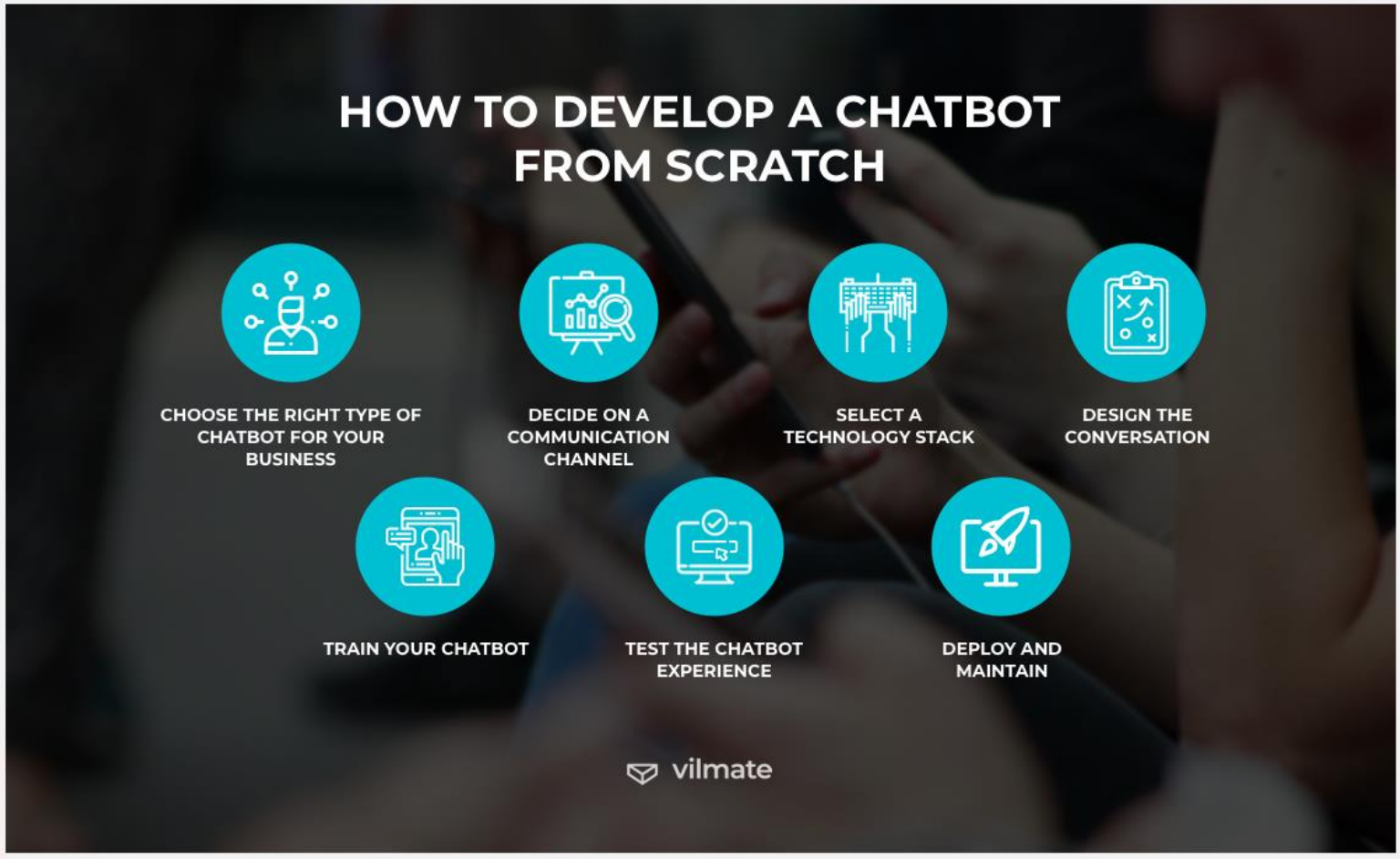
- Web application framework written in Python
- It helps to provide a way for web servers to pass requests to web applications
- Create end to end project



Flask Framework

Chatbot Development

Chatbot Development



Chatbot Development - Introduction

About Watson Assistant

In this project, we will be utilising the Watson Assistant to create our chatbot. It connects and delivers to the user an deliver an engaging, unified problem-solving experience.

How does Watson Assistant works in this project?

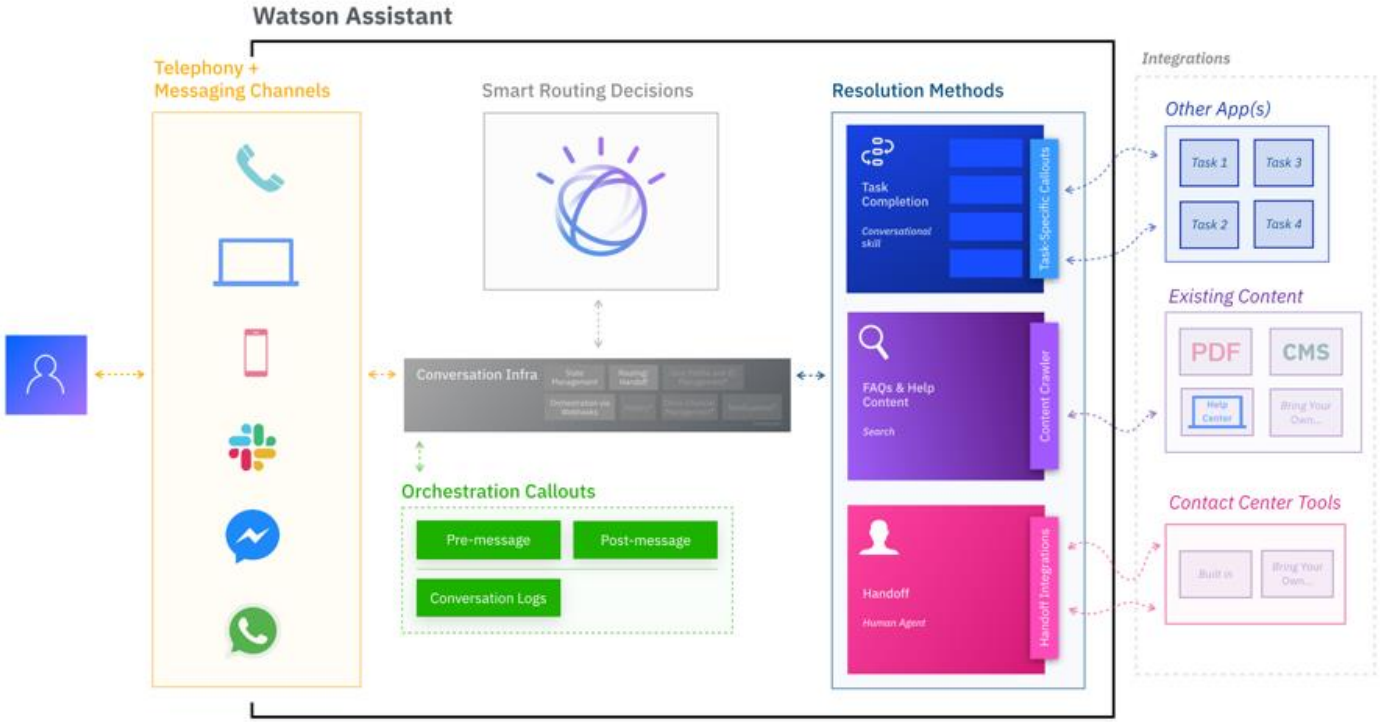
1.Create AI-driven conversational flows
Our assistant uses industry-leading AI capabilities provided by Watson to understand questions that our users ask in natural language. It uses machine learning models that are custom-built from our data to deliver precise answers in real time.

2. Bringing the assistant to your users, no matter where they are
We can configure one or more built-in integrations to quickly publish our assistant onto website or mobile phone. For this project, we integrated it into our website as chat widget so that it can become the go-to help resource for users.

3.Track user satisfaction and engagement
There are built-in metrics that can analyze logs from conversations between users and the assistant to gauge how well it is doing and identify areas that need improvement

Chatbot Development - Watson Assistant (How it works)

This diagram illustrates how IBM Watson Assistant delivers an omnichannel and exceptional, customer experience:



Chatbot Development - Watson Assistant (Learn the Basics)

Actions and **Steps** are the only two things you need to know to build a an AI-powered virtual agent.

What is an action?

An action is a problem or a task that our user wants to resolve. Anything from paying a bill to getting an invoice to saying hello to asking questions about cheese could be an action in our assistant.

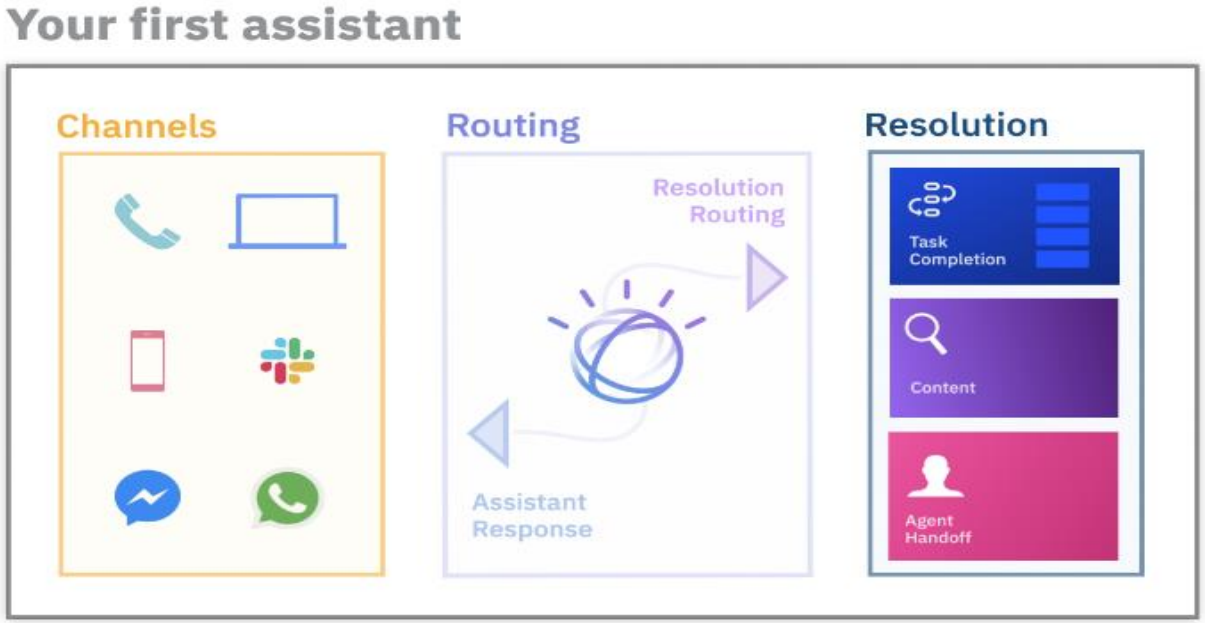
What is a step?

It is just a back-and-forth interaction between the our assistant and our user. It simply represent the clarification questions and final answer.

Everything else that the step needs to function like the flow logic, response options, or storage of the user's response is contained within the structure of the action itself so there is no longer a need to create separate entities and intents as part of a dialog skill

Chatbot Development - Planning our Assistant

Before we started building our assistant, we discussed and agreed on our overall goals and plan on how we are going to start. Our assistant can use different resolution methods to help with our users with their requests. Users can access through channels that we choose and configure. The following diagram illustrates the structure of the assistant after we build it:



Chatbot Development - Planning our Assistant

For this project, we considered the following planning steps and made key decisions upfront so as to keep us on track as we build:

1. ***Select an initial channel*** - For this, we decided that we should deploy our assistant to our website so that users can easily find it and communicate with it.

2. ***Picking our assistant's domain of expertise*** - We selected general knowledge of cheese, recipes and places to purchase it as the assistant's domain of expertise. Specific questions/tasks were curated thereafter for the assistant to help users with.

3. ***Choose the tone and language of our assistant*** - We choose a professional, consistent tone for our assistant.

4. ***Connect to content source*** - We connected our assistant to existing content sources on the internet so that information are readily available for the users.

Chatbot Development - Overview of building our assistant

After planning our assistant, it is time for the fun part which is building it. Before we start building it, we need to get familiarised with the core Assistant concepts of Watson assistant:

- **Intent** - purposes or goals that are expressed in a customer's input
- **Entity** - used for identifying interesting parts of the user's utterance, such as names and dates
- **Dialog node** - represents the start of a thread of dialog between your assistant and the user. It contains a condition that must be met for the node to be processed by your assistant. At a minimum, it also contains a response.
- **How to link our intents and entities to dialog nodes**

Next, we shall proceed to start building a dialog. We started with determining users' needs that we want the assistant to address on our behalf. They are essentially information about **cheese, cheese recipes** and **where to purchase cheese**.

Chatbot Development - Overview of building our assistant

Step 1 - Creating intents

We created various intents which addressed the aforementioned users' needs, for example **#aboutcheese**, **#cheeserecipes**. After defining the intents, we can start building a dialog that addresses them with simple responses such as providing more information or directing the user to a website which offers more details.

Step 2 - Adding Entities

Next, we added a set of entity values that represent vocabulary that is often used in the context of the intents created in step 1, for example **@recipes** and **@about_cheese**. By defining entities, we can help our assistant identify references in the user input that are related to our cheese content.

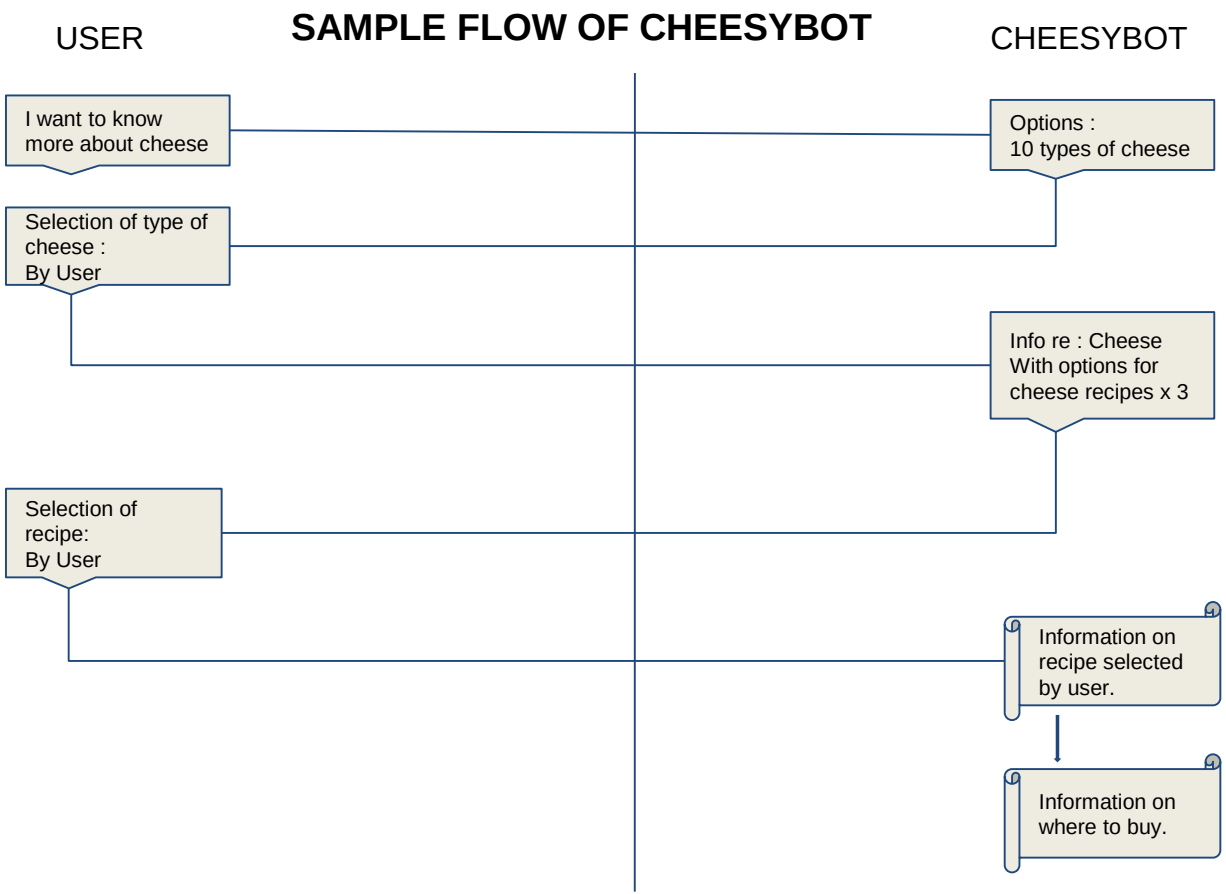
Step 3 - Adding dialog node

After completing step 1 and 2, we can start creating a dialog node. This represents the start of a thread of dialog between our assistant and the user. It also contains a condition that must be met for the node to be processed by our assistant in order to send a response to the user. For example in our case, a node condition might look for the **#about_cheese** intent in the user input and respond with more information about cheese. We also added child nodes to prolong the exchanges with the user.

Step 4 - Trying the assistant out and deployment

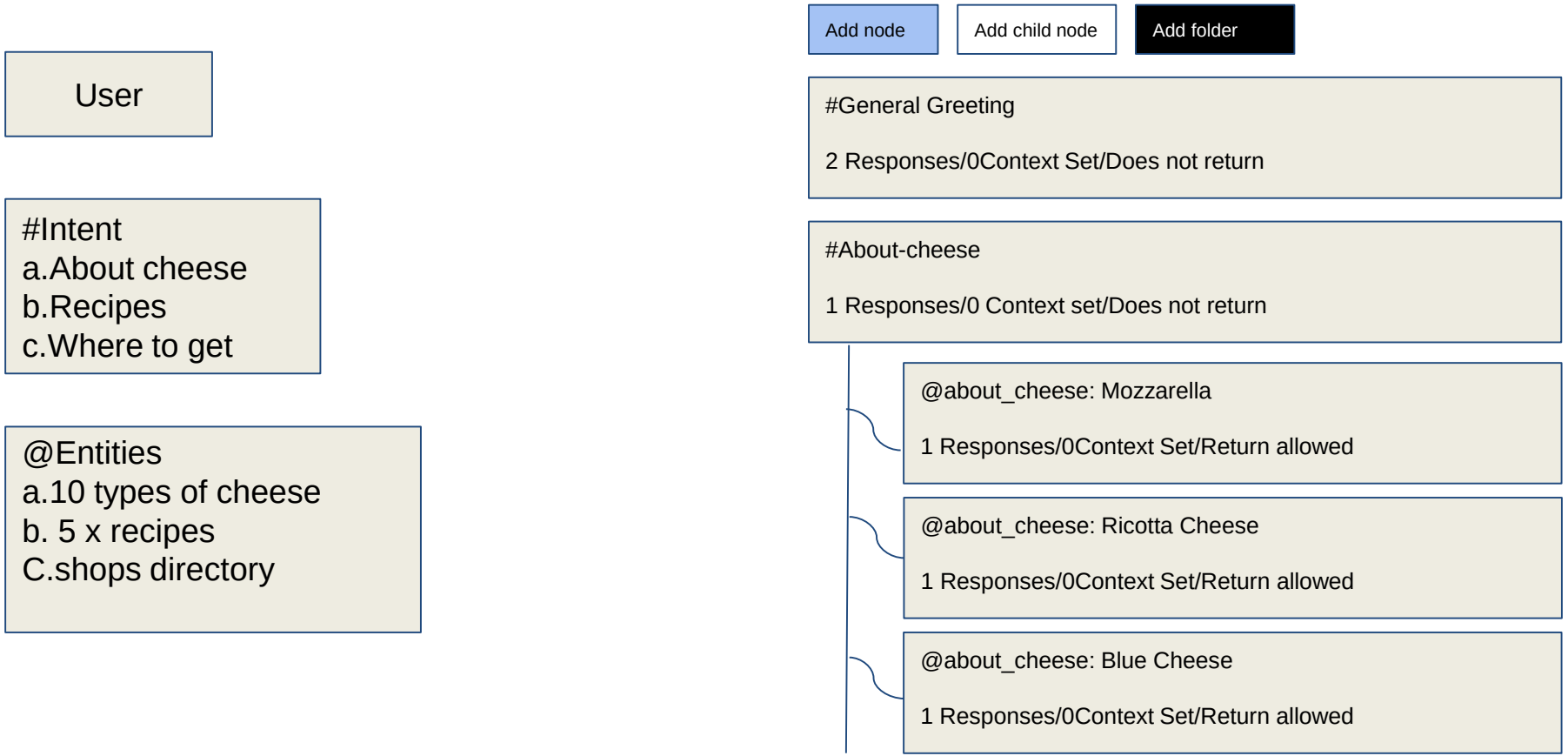
As we go along adding more nodes to our dialog tree, we will also concurrently test our assistant out in the "try it out" panel. Once we successfully created a working assistant that can handle the key tasks, we will add an integration and deploy our assistant to our website, refinements to it will be added when needed.

Chatbot Development - Sample flow chart

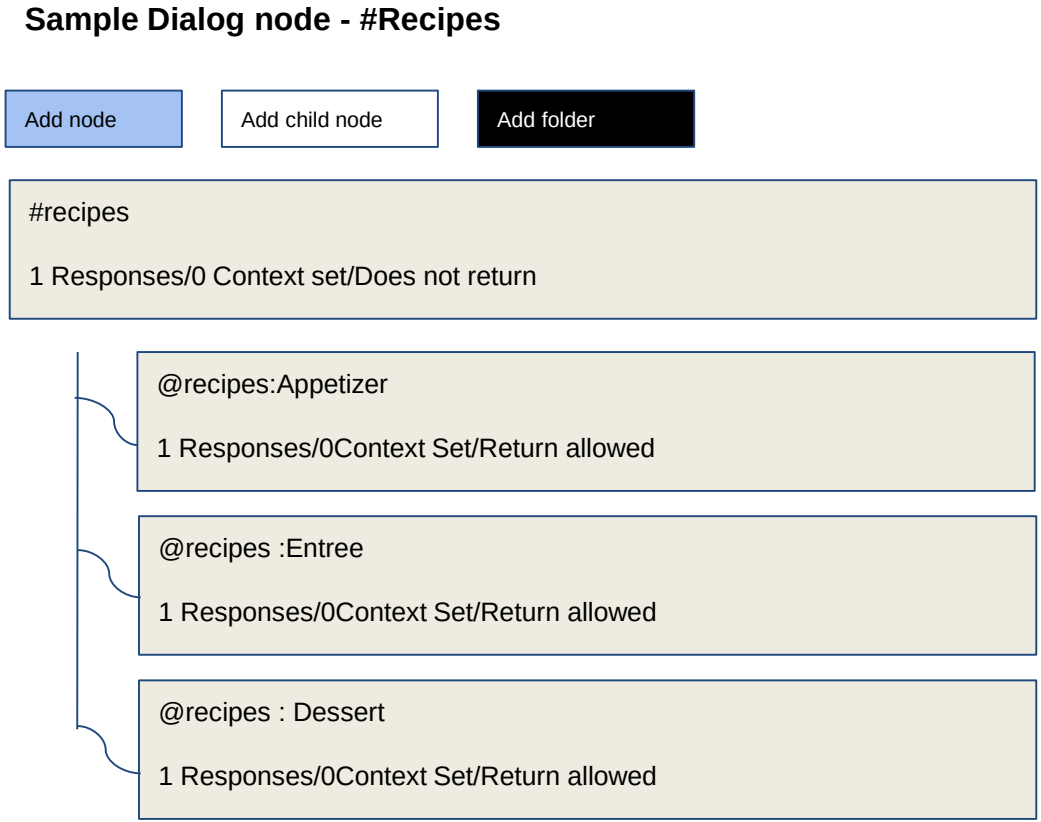


Chatbot Development - Sample flow chart

Sample Conversation Flow and Dialog nodes in Watson Assistant



Chatbot Development - Sample flow chart



PROJECT LEARNINGS

Summary & Reflection

Constraints and Challenges

Constraints

1. Watson Assistant chatbot interface is not exactly user friendly and need time to troubleshoot.
2. We have not tried other chatbot to make a summary of the pros and cons of each capabilities.
3. Lack of quality data.
4. A lot of trial and error involved as we have limited to no knowledge of programming and IT background.
5. Github file size limit of 25MB.

Challenges

1. There are limitations to Natural Language Processing (NLP).
2. Machine Learning (ML) needs a very defined set of rules in order to be effective.
3. The implementation of AI needs a lot of preparatory work.
4. Tuning the model can be very time consuming.

Takeaways

- ★ Machine Learning is time consuming and laborious.
- ★ Advantages of Python programming language.
- ★ Gain exposure to IBM Watson Assistant and creating a chatbot from scratch.
- ★ Working together as a team and leveraging the strength of each member
- ★ Problem solving using skills we learnt ie. EDT, AI.

Reference

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Model Deployment

Thank You