AI For Business Leaders Course

Project Steps: Delivering an ML/AI Strategy

AI for Business Leaders
Project Step 2C

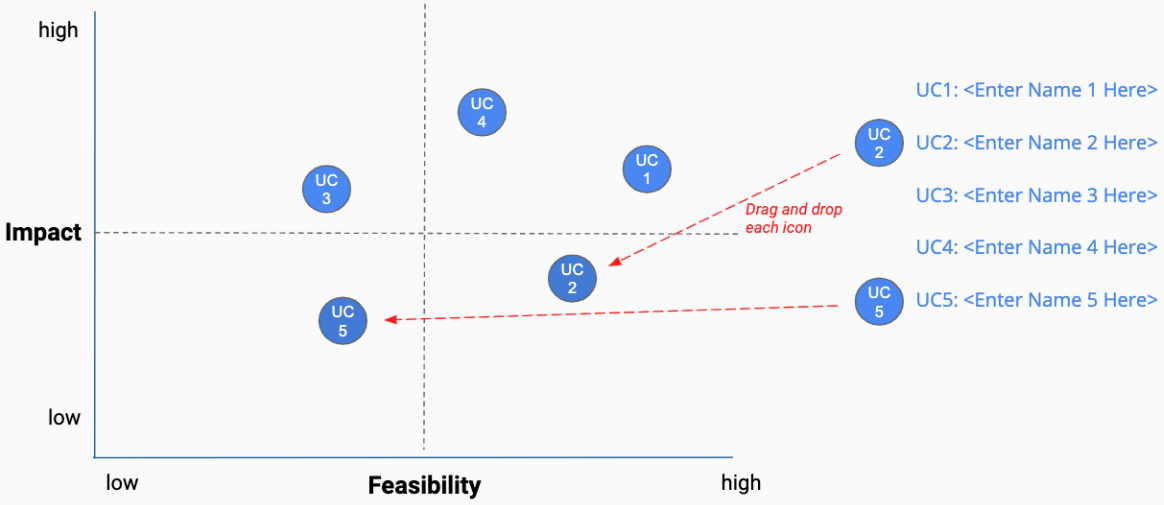
First Prioritization Grid

Your First Prioritization Grid

DIRECTIONS: For each of your use cases, review your answers to the 5V questions in Step 2A, and the operations you chose in Step 2B.

Then on the grid **on the next slide**, not this slide, move each blue use case icon to a place indicating how you see this use case's impact and feasibility.

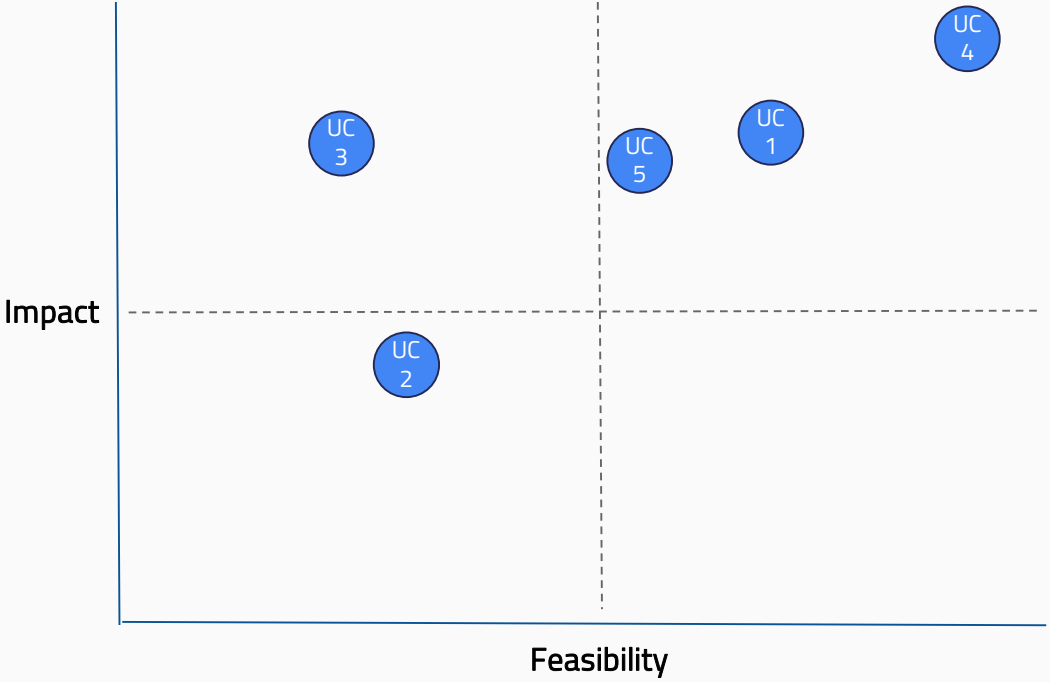
(Recall that the upper right quadrant is usually the most desirable, as it indicates we expect higher feasibility and greater impact.)



- *Drag and drop icons* UC 2 *for each use case*
- *Remember to think about both axes!*

First Prioritization Grid
(Follow directions on previous slide)

Feasibility vs. Impact



Key criteria assessed

- Fidelity in Simulation
- Risk (mission/human)
- Human Factors
- Time Reduction
- Implementation Costs

Now Prioritize and Eliminate Three Use Cases

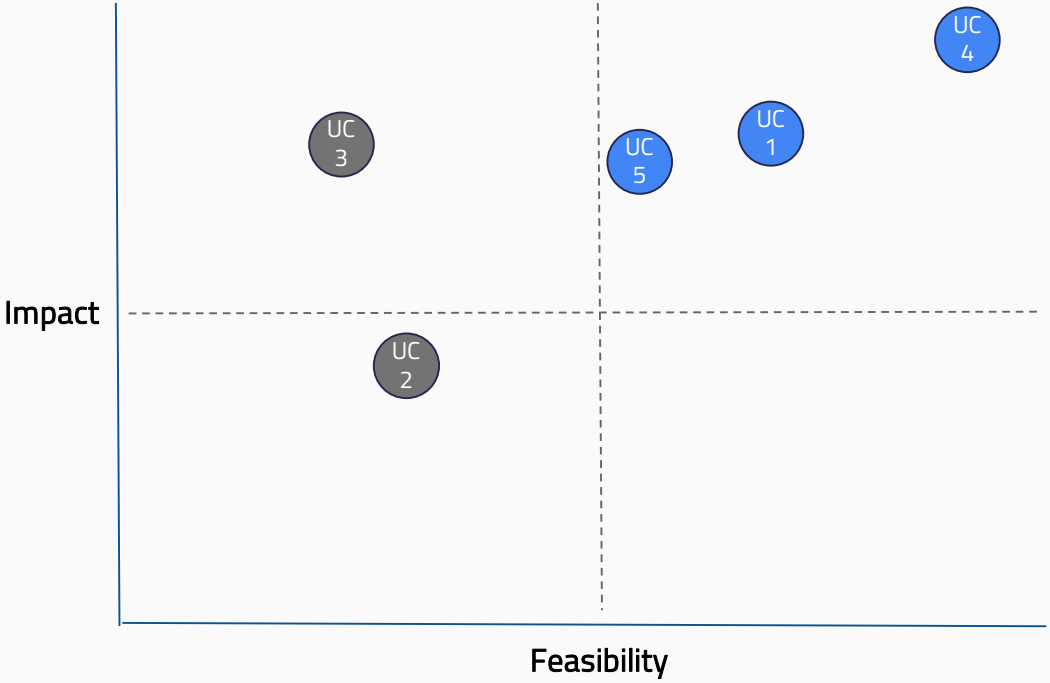
1) Review the locations of your use cases on the grid on the previous slide. Remember we want to prioritize use cases for AI and ML that offer the greatest impact for the least difficulty.

2) Now in the grid on the previous slide change the color from blue to grey for two use case circles you want to de-prioritize.

3) This leaves your top three use cases in **blue** that you want to move forward with in the rest of the project.

First Prioritization Grid After Pruning

Feasibility vs. Impact



Key criteria assessed

- Fidelity in Simulation
- Risk (mission/human)
- Human Factors
- Time Reduction
- Implementation Costs

Nice work, you've completed Step 2C of the project!

AI for Business Leaders
Project Step 3

Architectures for Top 3 Use Cases

Creating High Level Architectures

For the top three use cases you prioritized in Project Step 2C, you'll now create a high level architecture for each, on slides 10-12.

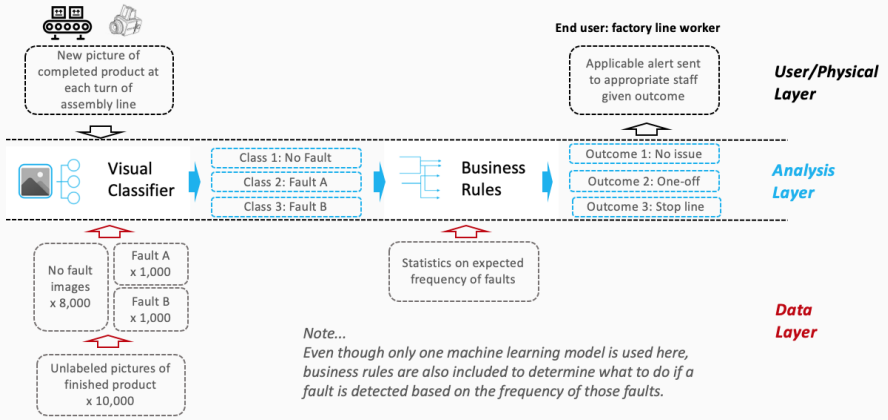
For this step, be sure to review Lesson 3 but also recognize that this process allows significant creative freedom.

Keep a focus on…

- Data flow/direction
- Clear view on inputs/outputs
- Simplicity

Write the use case name at the top of each slide.

Sample Completed Architecture



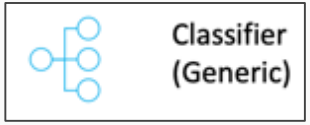
Do all work on slides 10-12:

- *Copy and paste capabilities* 

from slide 9 into Analysis Layer
- *Identify relevant User/Physical and Data Layer attributes*
- *Copy and paste arrows from slide 9*  *to show data flow, input/output*
- *Use annotations to help explain difficult concepts*

Your AI/ML Toolkit - List of Capabilities

Generic ML Capabilities

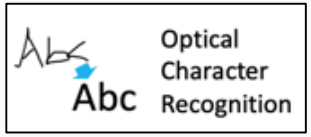


Natural Language Processing

Voice/Speech Processing

Other Capabilities

Computer Vision



Drawing Tools

User/Physical Layer

Analysis Layer

Data Layer

AI/ML Toolkit - Icons

Sound Files (Voice) 

Images (Camera) 

Documentation (Data) 

Configurations/Setup Files 

Map (Coordinates) 

Geo-Tag (Coordinates) 

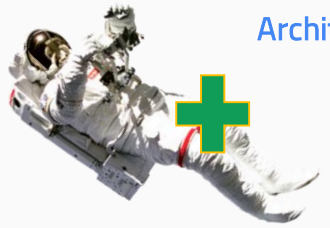
Communications (Signal) 

Goal (Coordinates) 

Performance (Increased) 

Architecture 1/3 - Virtual Assistants

User/Physical Layer



Voice Recognition

Facial Recognition

Velit egestas dui id ornare pah.

Utterance Classifier

Visual Classifier

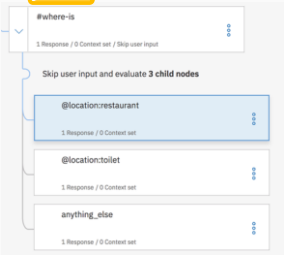
Velit egestas dui id ornare arcu.

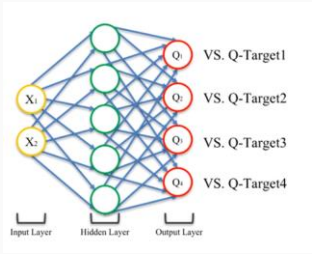
Sentiment Indicator

Optimizer (Generic)

Policy Learner (Generic)

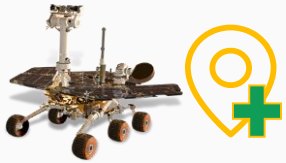
Analysis Layer





Data Layer

Architecture 2/3 - Planetary Exploration



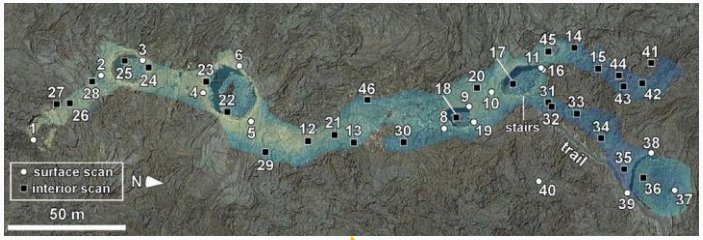
User/Physical Layer

Visual Classifier

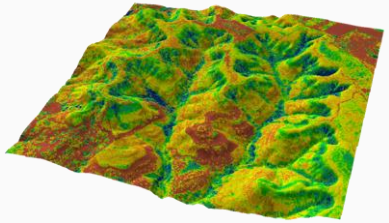
Classifier (Generic)

Optimizer (Generic)

Policy Learner (Generic)



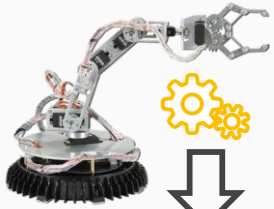
Analysis Layer

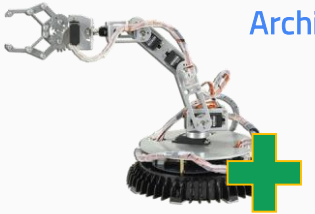


Data Layer

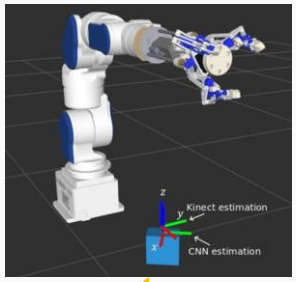
Architecture 3/3 - System Design & CAD

User/Physical Layer





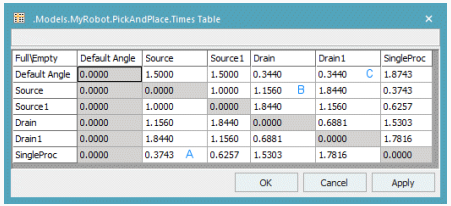
Simulator (Generic)

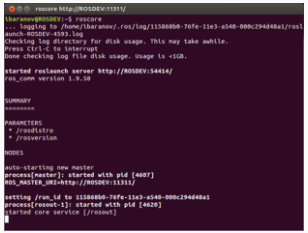


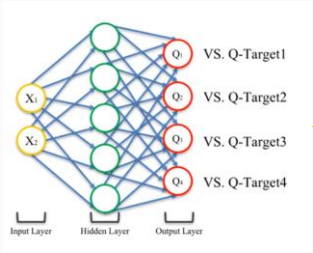
Optimizer (Generic)

Policy Learner (Generic)

Analysis Layer







Data Layer

Excellent, you've completed Step 3 of the project!

AI for Business Leaders
Project Step 4C

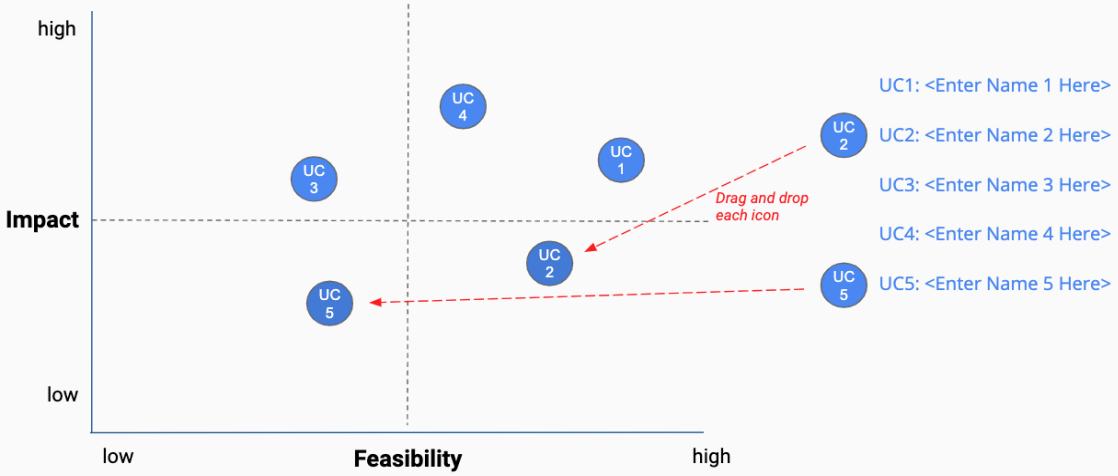
Second Prioritization Grid

Your Second Prioritization Grid

Based on new information from your further analyses of your use cases in step 4A and 4B, you'll engage in the same exercise as you did before in Step 2C to update your prioritization.

Move onto the grid the three use cases that you have been working with in steps 4A and 4B.

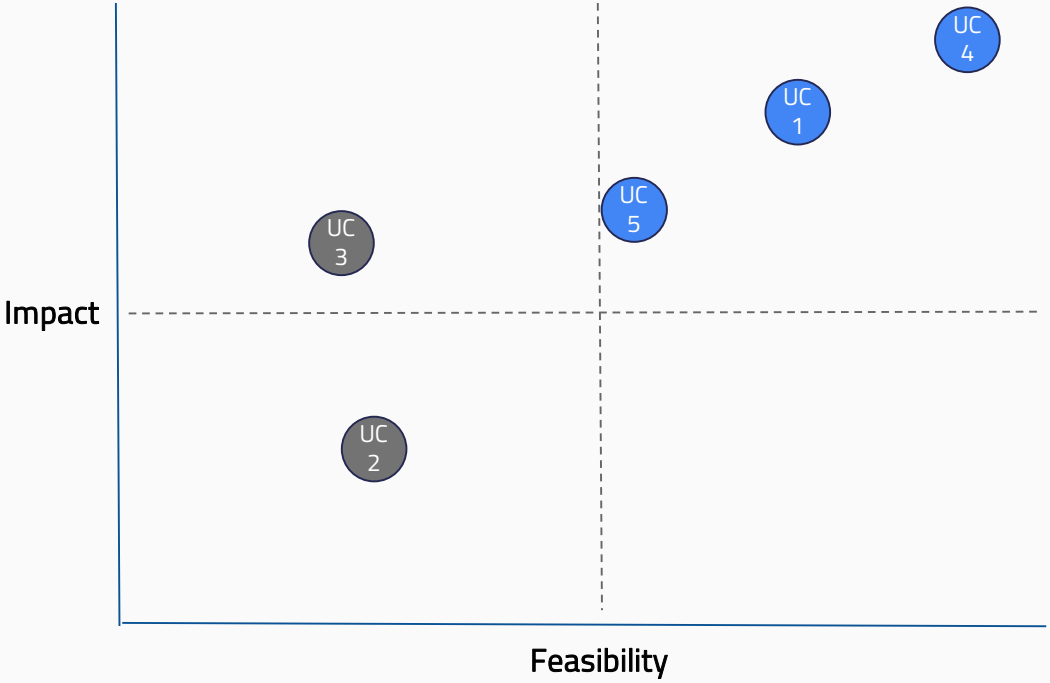
You MAY choose different use cases and shift your focus, if you feel these exercises have caused you to significantly revise your prior evaluations.



- *Drag and drop icons* UC 2 *for each use case*
- *Remember to think about both axes!*

Second Prioritization Grid

Feasibility vs. Impact



Key criteria assessed

- Fidelity in Simulation
- Risk (mission/human)
- Human Factors
- Time Reduction
- Implementation Costs

Now Prioritize and Eliminate One More Use Case

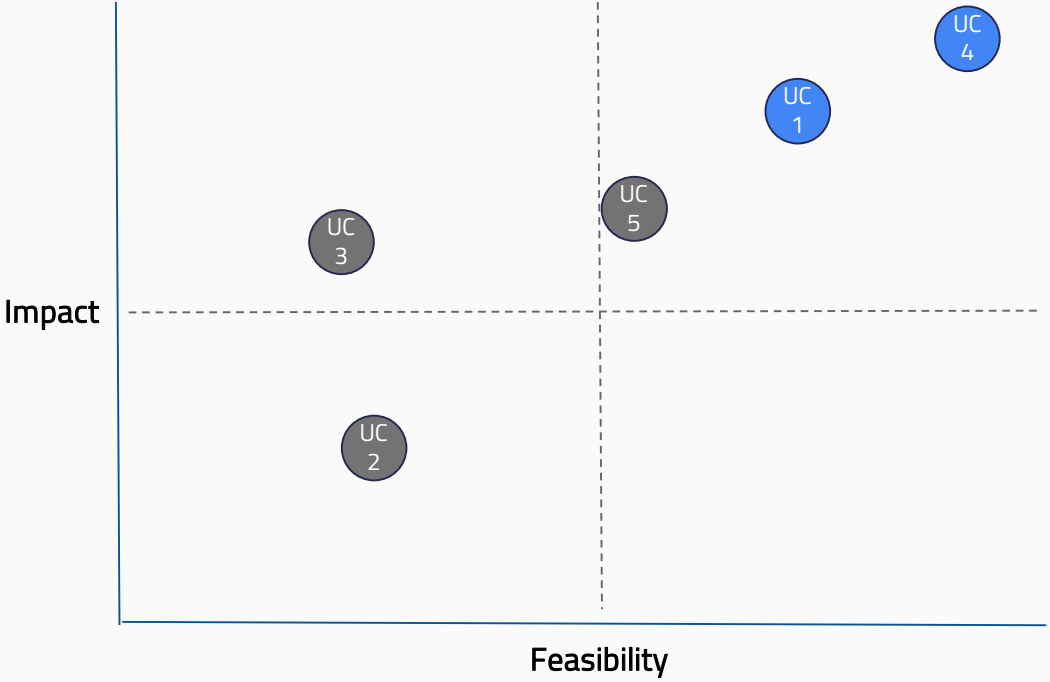
1) Review the locations of your use cases on the grid on the previous slide. Remember we want to prioritize use cases for AI and ML that offer the greatest impact for the least difficulty.

2) Now in the grid on the previous slide change the color from blue to grey for one use case circle you want to de-prioritize.

3) This leaves your top two use cases in **blue** that you want to move forward with in the rest of the project. But you may still change these later.

Second Prioritization Grid

Feasibility vs. Impact



Key criteria assessed

- Fidelity in Simulation
- Risk (mission/human)
- Human Factors
- Time Reduction
- Implementation Costs

Terrific, you've completed Step 4C of the project!

AI for Business Leaders
Project Step 5

Operational Considerations:
Accuracy, Bias, and Ethics

Accuracy, Bias, and Ethics Concerns

For each of your two remaining use cases, on the next two slides please write 2-3 paragraphs discussing how success will be measured and monitored.

- Start by focusing on how model effectiveness would be measured, and speak to what success would look like.
- Comment on any other operational concerns, including bias in the data, or ethical limitations, that could influence success.
- For each concern you raise, comment on how you would measure or monitor this concern on an ongoing basis.

First Use Case

For speech recognition, the metrics include the accuracy and confidence in recognizing the astronaut's commands. These values need to exceed 95%. For a set of given intents, the correctness of the virtual assistants will be measured and compared. Correct responses to object locations, protocol/event processes descriptions, and scheduling must exceed 95%. For qualitative results based on affective computing and sentiment analysis, the NASA-TLX test will be used with daily surveys with the astronaut to report their happiness with the virtual assistant's responses. Initially, it is required that the astronaut's overall satisfaction with the virtual assistants must exceed 80% (on a scale of one to ten) to prevent additional stressors and cognitive load during missions and operations. This percentage must increase regularly (by a few % each week) and will hopefully reach 100% within one year of implementation. For computer vision-related tasks, classification accuracy and the sampling rate will be measured. Classification must exceed 95% and the sampling rate must align with mission protocols (currently in development).

Overfitting can be an issue if attempting to use the same speech recognition and sentiment analysis (extracted from voice, also called *affective computing*) from a single astronaut. Since transfer learning will be implemented, it is not clear if the "best responses" for one astronaut will be compatible with another. In the worst-case, overfitting might be found acceptable and each astronaut can have their own artificial agent assigned to their "profile" (this might even be an optimal solution).

Ethical considerations are conditionally important, as the astronaut's voice will be recorded and fed into the network to improve automatic speech recognition accuracy and response capabilities. The image documentation may also include the personal details regarding the astronaut at "non-graceful" times. This data should only be stored "offline" in secure databases within the International Space Station (which is quite difficult to hack remotely). A special network will be created with a blockchain broker (IRoT and Sophia) to ensure that this data cannot be accessed from the earth, other spacecraft, or satellites.

Second Use Case

Classification performance will be measured with metrics including accuracy, precision, and the F1-score. Ideally, these values will approach “one, ” with a minimum acceptable F1-score of 0.95. Other metrics including bandwidth, frequency, and speed (communication; processing) will be optimized with reinforcement learning. The goal of minimizing these “non-traditional AI” metrics is to minimize the EDP (energy-delay product). The policy that minimizes these values quantitatively (matrix form with weights) will be added to a recipe. The target value is to decrease the total EDP by at least 40%. Transfer learning will be implemented with these recipes such that satellites, drones, and even spacecraft, will be able to quickly apply analysis skills gained across devices. Finally, the mission time (high-level) speed required to conduct remote sensing and surveillance shall be optimized such that the minimum time to map a single sector is improved by 500% through a combined “orchestration.”

The remote sensing data acquisition process might yield a lot of noise, and thus, “dirty data” and underfitting. This will be overcome by sampling a single area multiple times and with multiple agents (drones and satellites). In highly contestable cases, the visual data will be flagged and escalated. Furthermore, rover sensor data is susceptible to missing data and it is more challenging to resample an area. A priority protocol shall be constructed to give higher weights to rover data due to close range proximity (proximity to a “ground truth”) and longer resampling time restrictions. Drones cannot fly during certain weather conditions (and at certain times in the evening due to larger wind gusts on the moon and Mars). The satellite constellation, drones, and rovers will need to operation in an “orchestration” to maximize the throughput and minimize time with missing data.

There are no ethical concerns related to data privacy laws for humans. However, robotic devices can be hacked and are subject to adversarial attacks (injection of fraudulent imagery from camera sensors), among other cybersecurity concerns. While highly unlikely given the remoteness of the moon and Mars, measures will be taken to mitigate such cases. An autonomous Blockchain broker agent will be implemented to increase the security of the robot-to-robot (R2R) communication network (IRoT).

Well done! You've completed Step 5 of the project!

AI for Business Leaders
Project Step 6B

Feedback and
Final Prioritization Grid

Feedback Visualization

Depending on how you chose to gather feedback -- survey, phone call, etc. -- you will have a mix of quantitative and qualitative results.

Use the following pages to document your key takeaways in the form of verbatim quotes and visualizations.

For verbatim quotes, you should use direct quotes that indicate the support and critiques you encountered.

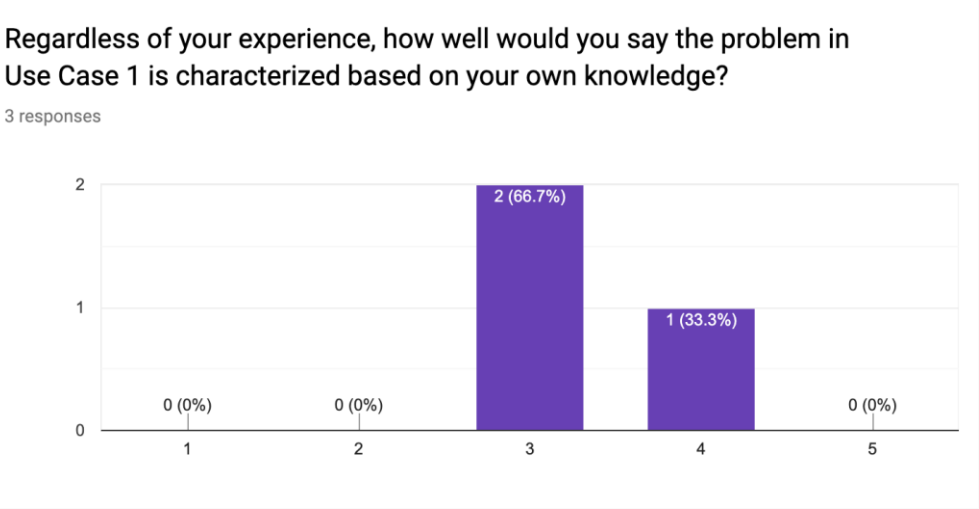
For visualizations, feel free to use the graph provided in your Google Form.

Verbatim Quote Example

"Great job with x, y, z"

"Use case 7 would fundamentally change our business because of _____"

Visualization Example



Verbatim Quotes - Virtual Assistants

“There is a really big impact and this could also be used in factories and other smart places like homes in the future”

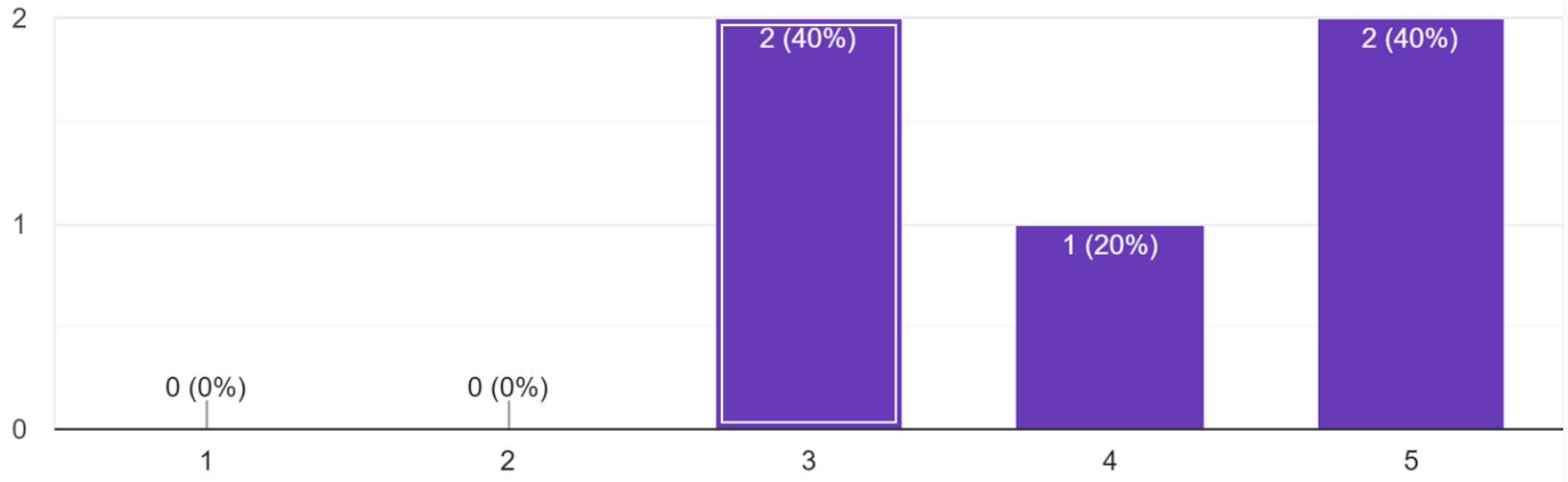
“Astronauts are always overburdened and this limits the number of experiments that can be approved. Many more experiments will be possible in the future with this implementation.”

“I am excited to see the improvement on the astronauts’ performance. If it works, it would change the future.”

Visualization - Virtual Assistants

If the solution proposed in Use Case 1 worked, to what extent do you believe it would create business value (e.g., increase revenue or reduce costs) for people in your business?

5 responses



Verbatim Quotes - Planetary Exploration

“If successful, this will allow for geo-spatial maps to be created much fast which allows for mission approval sooner.”

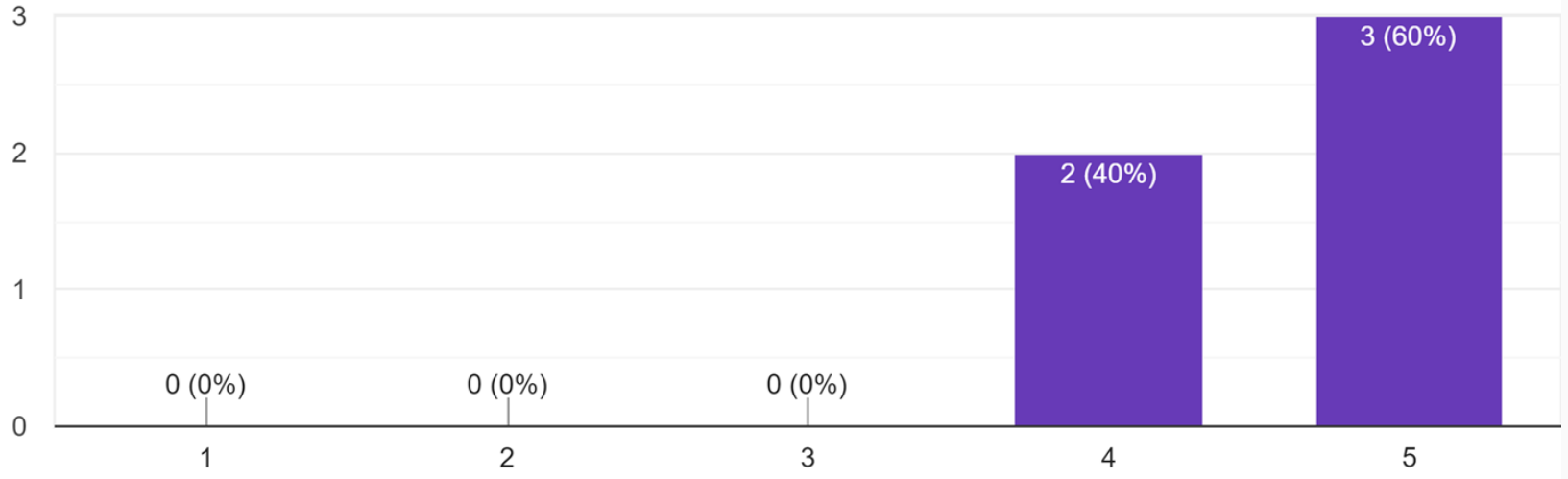
“Since seems like a common sense problem to me but I am excited to receive new images and maps from the ISS.”

“This method could also be used on earth and combined with GPS”

Visualization - Planetary Exploration

If the solution proposed in Use Case 1 worked, to what extent do you believe it would improve the day-to-day experiences of people in your business?

5 responses

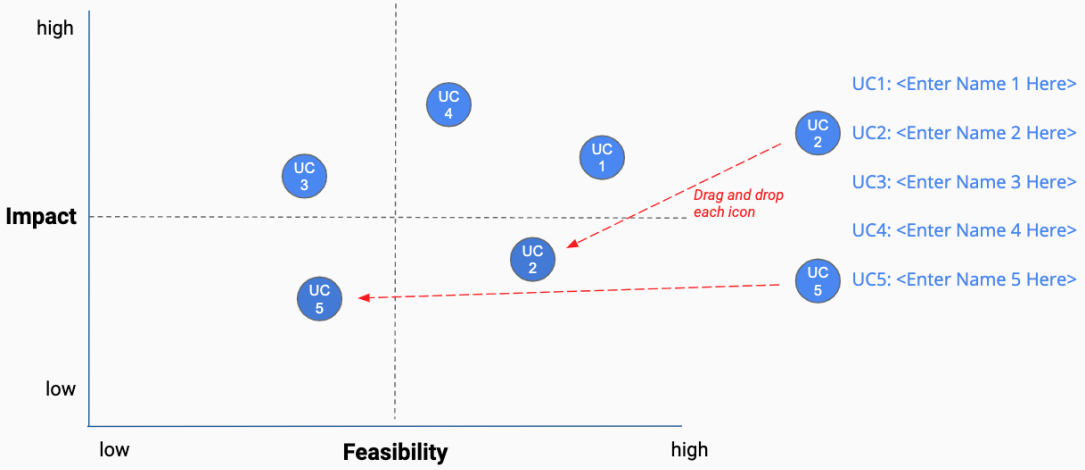


Your Final Prioritization Grid

Based on the feedback you've gathered, and all of the previous information for each use case, you'll now engage in the same prioritizing exercise as you have twice before.

You MAY choose to re-prioritize use cases and shift your focus if you feel these exercises have caused you to significantly revise your prior evaluations.

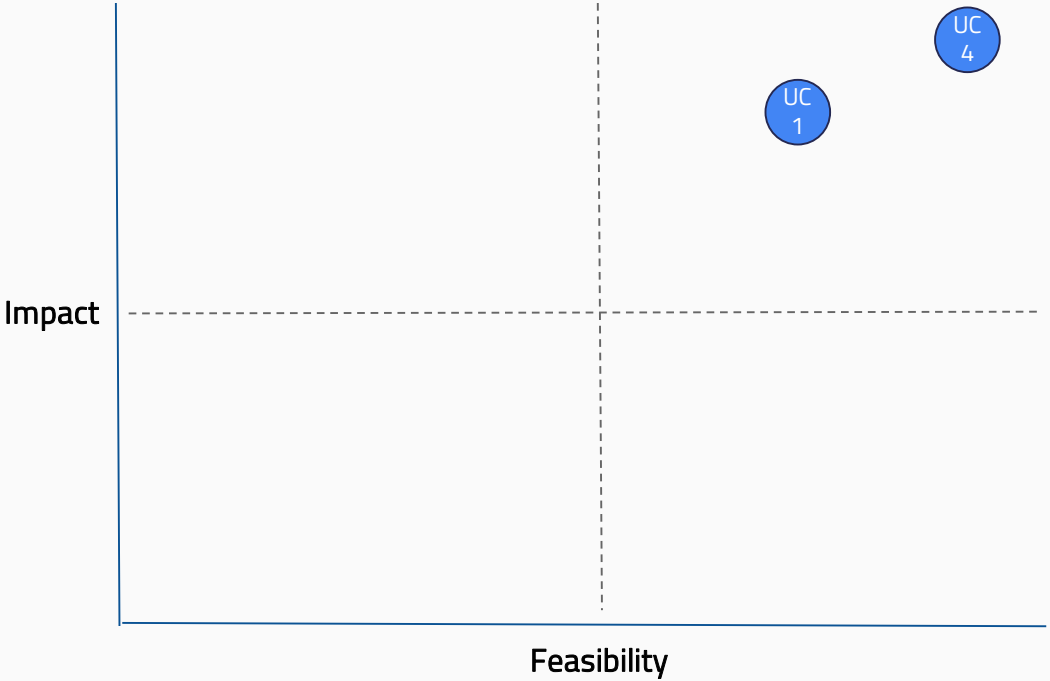
At the end of this exercise, you should have a final point of view on the use cases you'll advocate in your ML/AI strategy!



- *Drag and drop icons* UC 2 *for each use case*
- *Remember to think about both axes!*

Final Prioritization Grid

Feasibility vs. Impact



Key criteria assessed

- Fidelity in Simulation
- Risk (mission/human)
- Human Factors
- Time Reduction
- Implementation Costs

Nice work, you've completed Step 6B of the project!