

EXPLORE | DIGITAL SKILLS

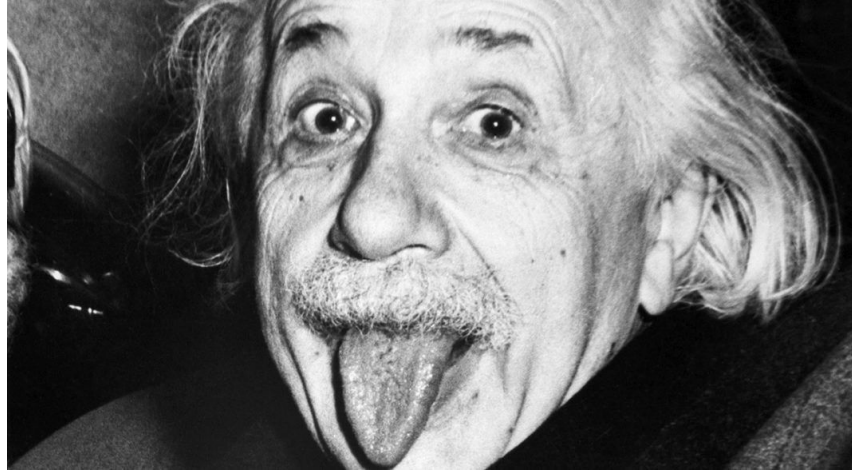
Problem Solving

Problem Solving Strategies

Why should I learn this?

“We can not solve our problems with the same level of thinking that created them.”

- Albert Einstein



- Effective problem solving requires a **structured, transferable, logical** approach
- Can be done through critical evaluation of a problem - known as **critical thinking**

So what is critical thinking anyway?

“The important thing is to not stop questioning.”

- Albert Einstein



Metacognitive awareness of our own thinking
i.e.

“Thinking about, monitoring and regulating our own thinking”

- Being aware of our own **thought processes** and **biases**, and actively working to address them
- Approaching a problem in **logical, unbiased** way
- Ensuring the **rigour** of the information we use

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How does it help me solve a problem?

“I suppose it is tempting, if the only tool you have is a hammer, to treat everything as if it were a nail.”
- Albert Einstein



- Gives you an **intellectual toolset** that can be applied to any problem
- Ensures that you **correctly define** the problem
- Ensures you **consider all parts** of the problem
- Ensures you produce the **best solution** for a problem

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First - try it on your own

Scenario 1: Group Activity

You are well known amongst your friends and community for giving good advice. A friend of yours knows a local business owner who needs some help. This person owns a successful supermarket, but is looking for ways to increase their monthly profit. How do you approach this problem and what do you tell them?

Resources/Data available:

Only what your friend has told you

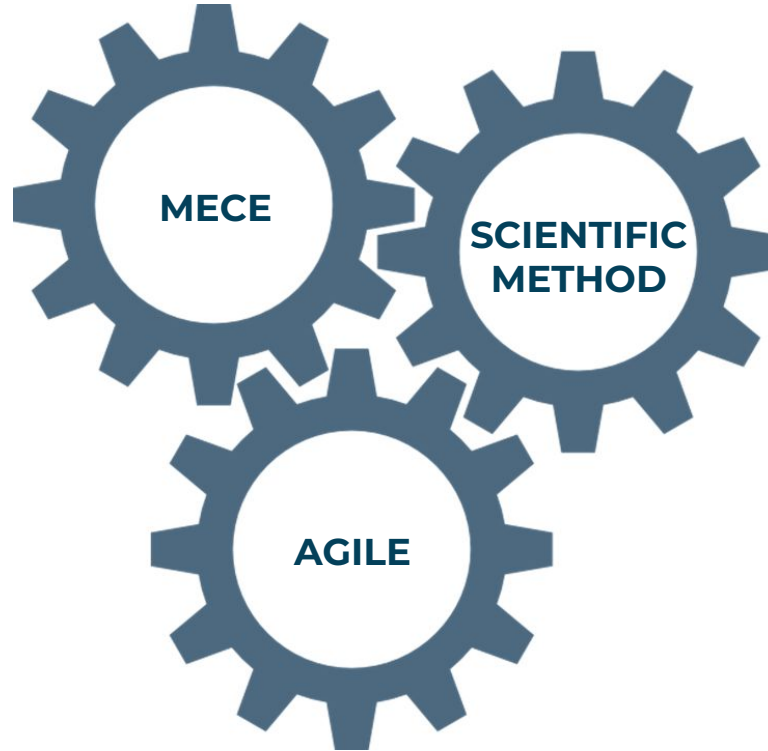


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So how do I solve a problem?

“If I had an hour to solve a problem I'd spend 55 minutes thinking about the problem and 5 minutes thinking about solutions.”

- Albert Einstein



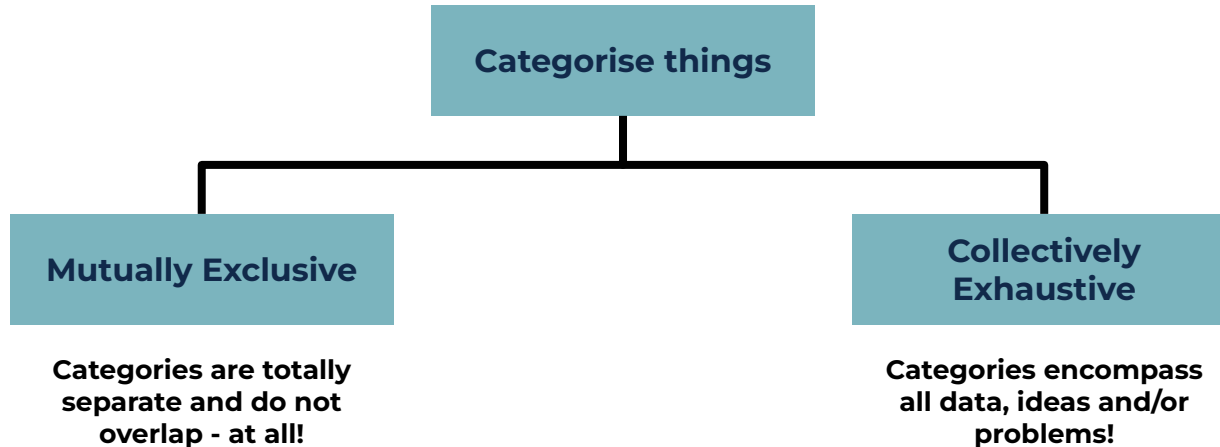
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Mutually Exclusive and Collectively Exhaustive (MECE)

“Don't try to figure it out all at once.”

- Albert Einstein

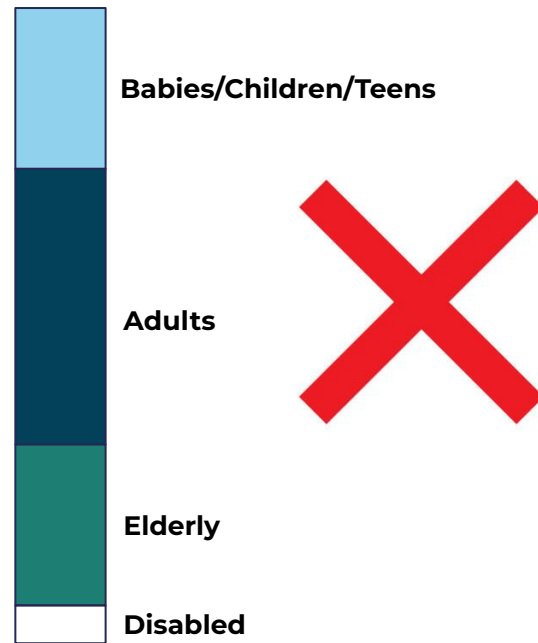
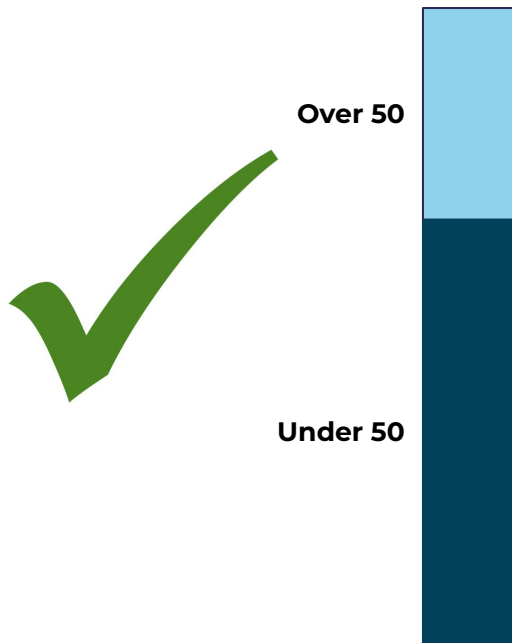
- Framework developed by [Mckinsey & Company](#) for dealing with problems in a **coherent, comprehensive** way
- Applicable to **all parts** of the problem solving process!



MECE - An example:

“If you can't explain it to a six year old, you don't understand it yourself.”

- Albert Einstein

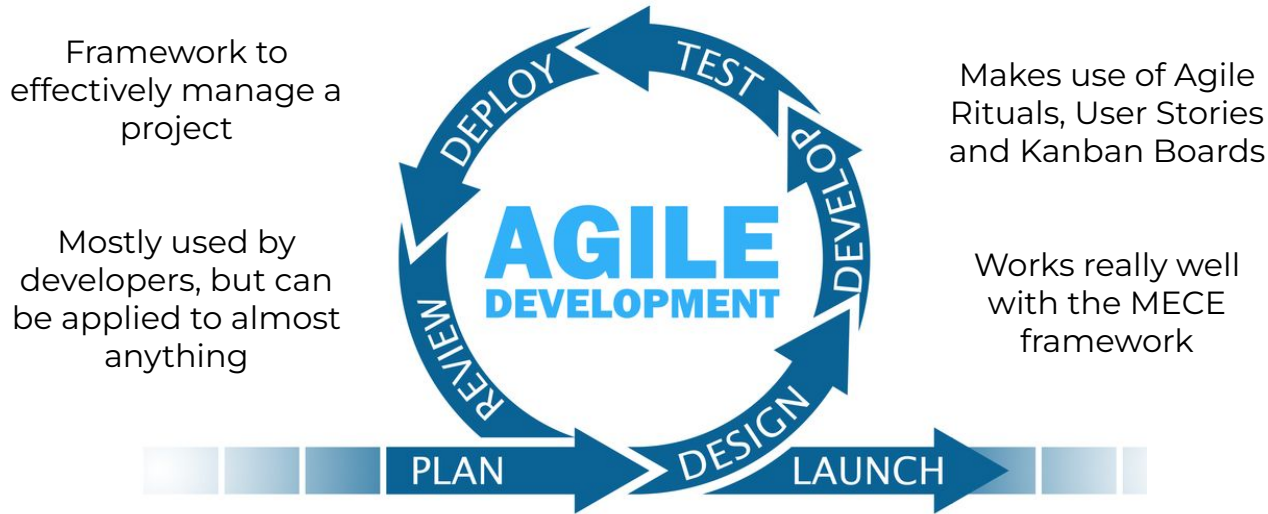


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Agile - Managing the problem

"Anyone can hold the helm when the sea is calm."

- Albert Einstein

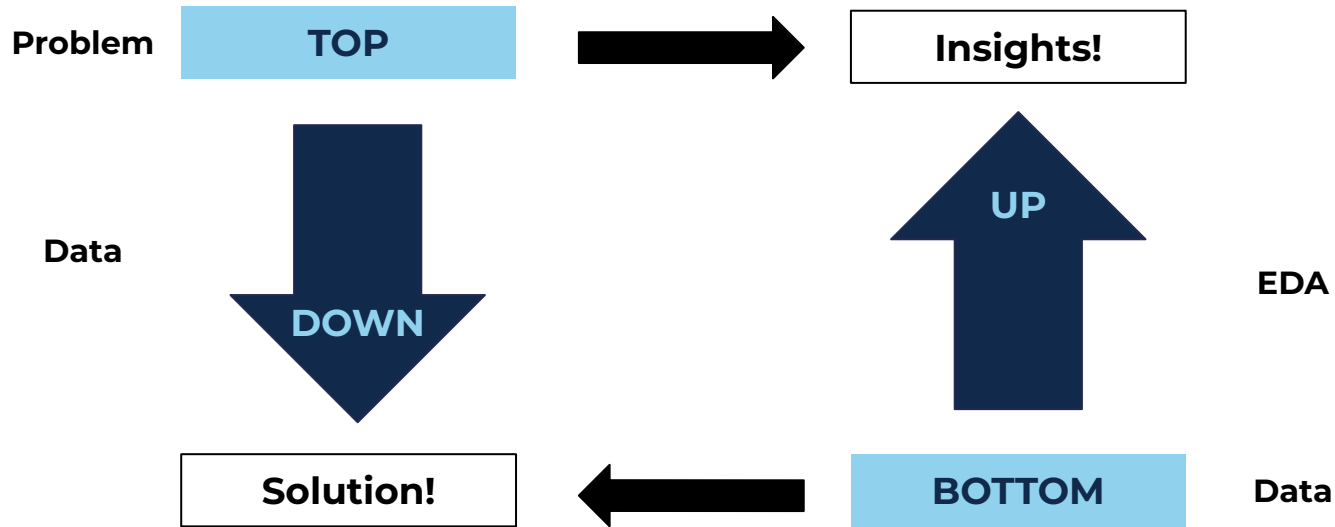


More on this later!

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Problem Solving in Data Science

“Truth has nothing to do with the conclusion, and everything to do with the methodology.”
- Albert Einstein

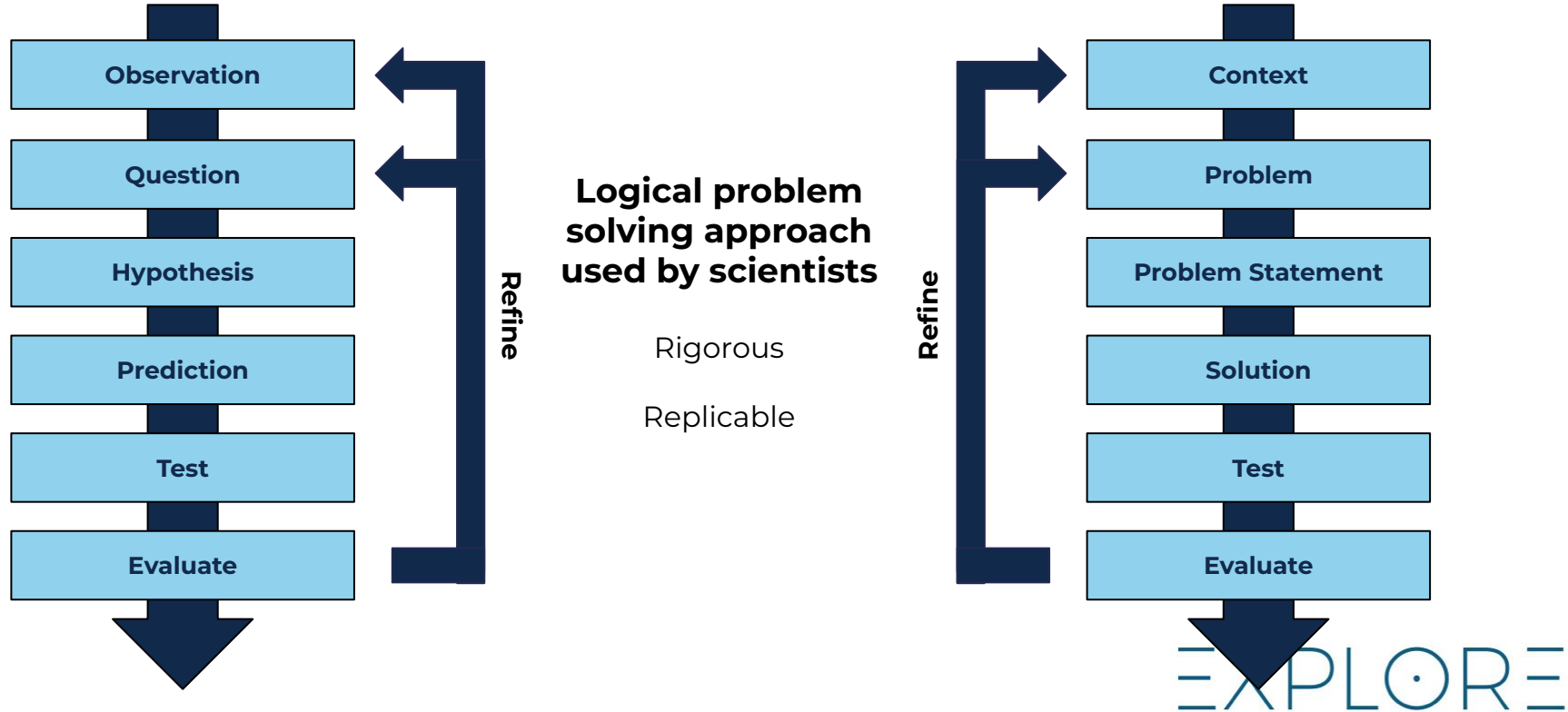


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The Scientific Method

“A man should look for what is, and not for what he thinks should be.”

- Albert Einstein



Lets apply this to our problem

Scenario 1: Group Activity

You are well known amongst your friends and community for giving good advice. A friend of yours knows a local business owner who needs some help. They tell you that this person owns a successful supermarket, but is looking for ways to increase his monthly profit. How do you approach this problem and what do you tell them?

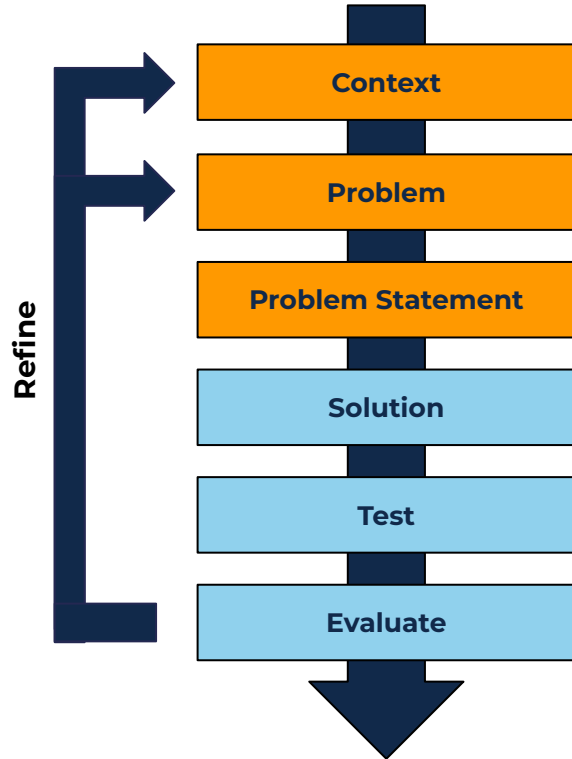
Resources/Data available:

Only what your friend has told you

Define the problem

“A problem well stated is a problem half solved.”

- Albert Einstein



Context:

You are well known amongst your friends and community for giving good advice. A friend of yours knows a local business owner who needs some help. **They tell you that this person owns a successful supermarket, but is looking for ways to increase their monthly profit.** How do you approach this problem and what do you tell them?

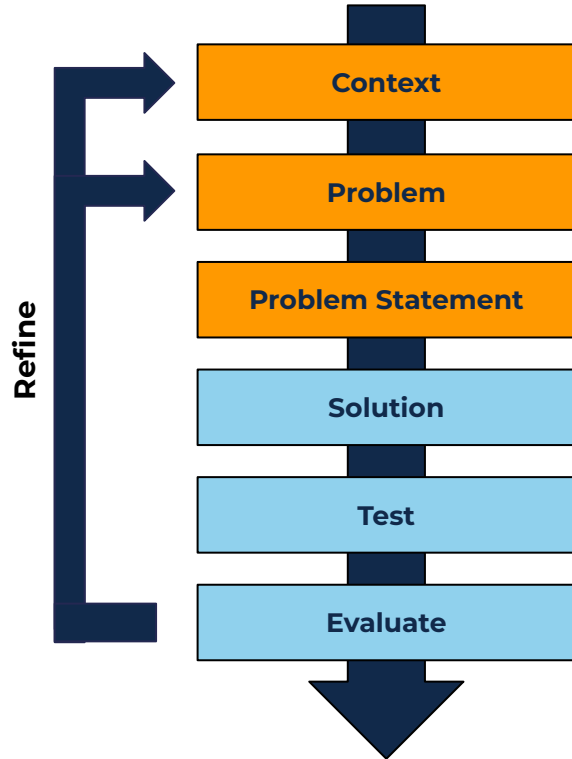
- Domain knowledge
- Research
- Consultation

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Define the problem

“A problem well stated is a problem half solved.”

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Problem:

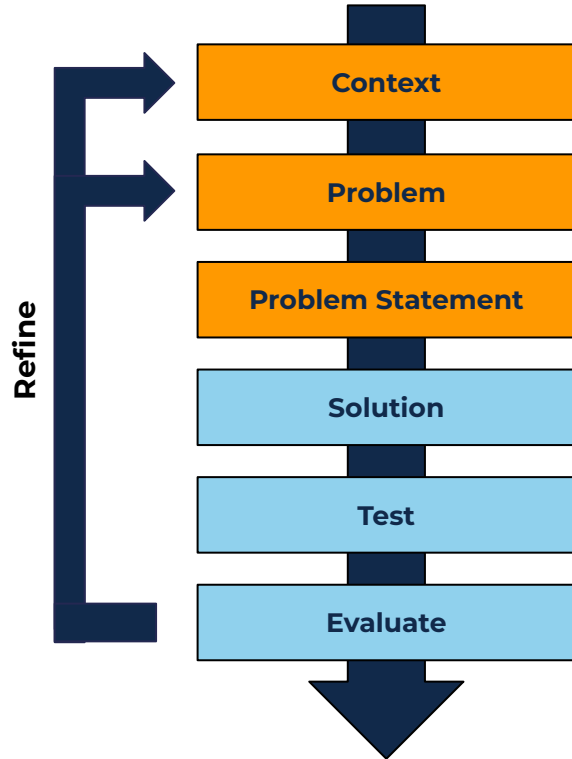
Monthly profit is not satisfactory

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Define the problem

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Problem statement:

- **Very important**
- **Single** sentence
- Statement of **intention**
- **High level** action to take
- Defines **scope** (i.e. what I'm going to do and not do in the project)
- **MECE compliant**
- Must be **refined**

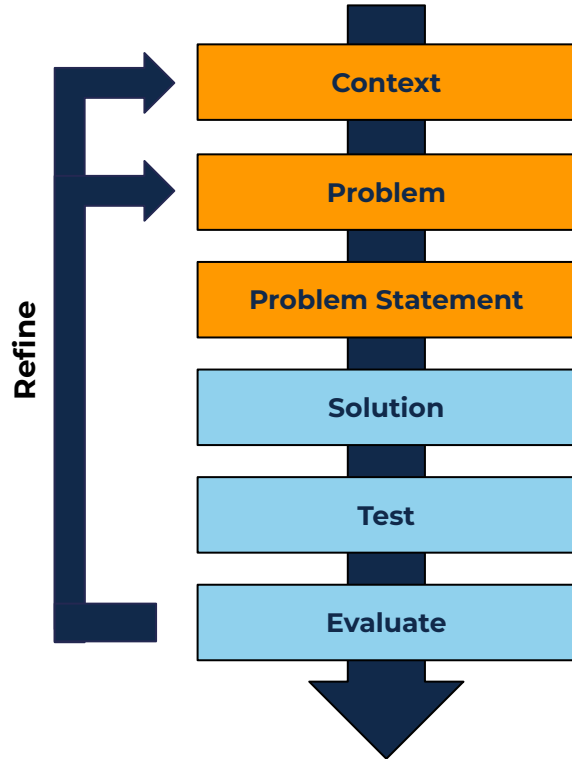
E.g. Increase the monthly revenue of the supermarket

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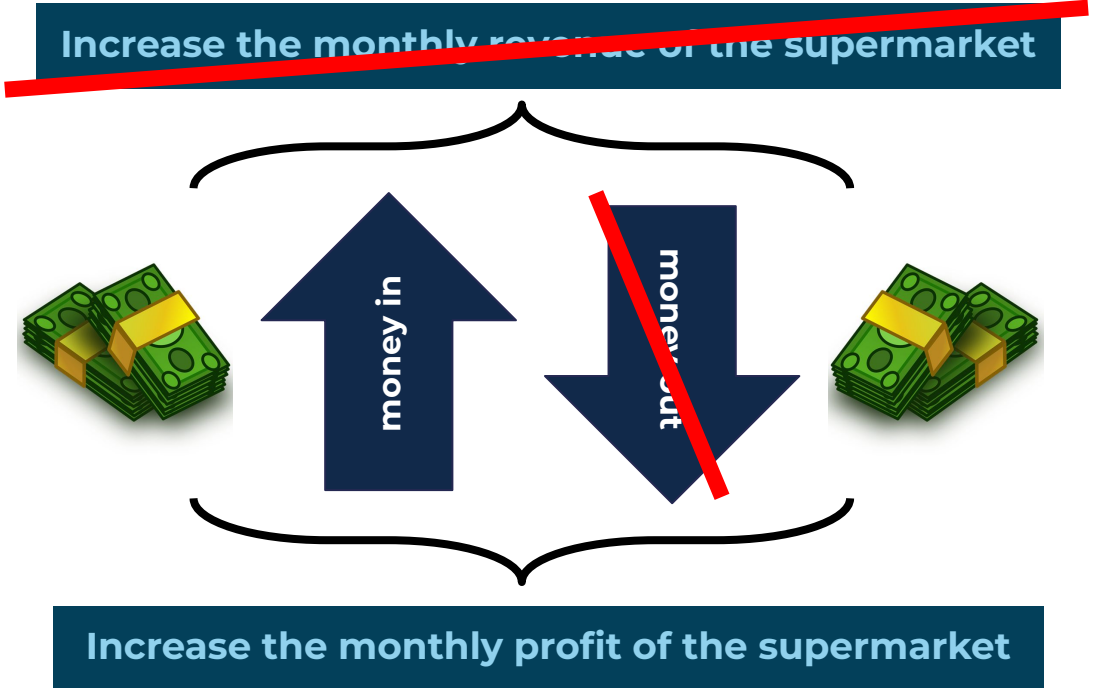
Apply MECE to the problem

“A problem well stated is a problem half solved.”

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Problem: Monthly profit is not satisfactory

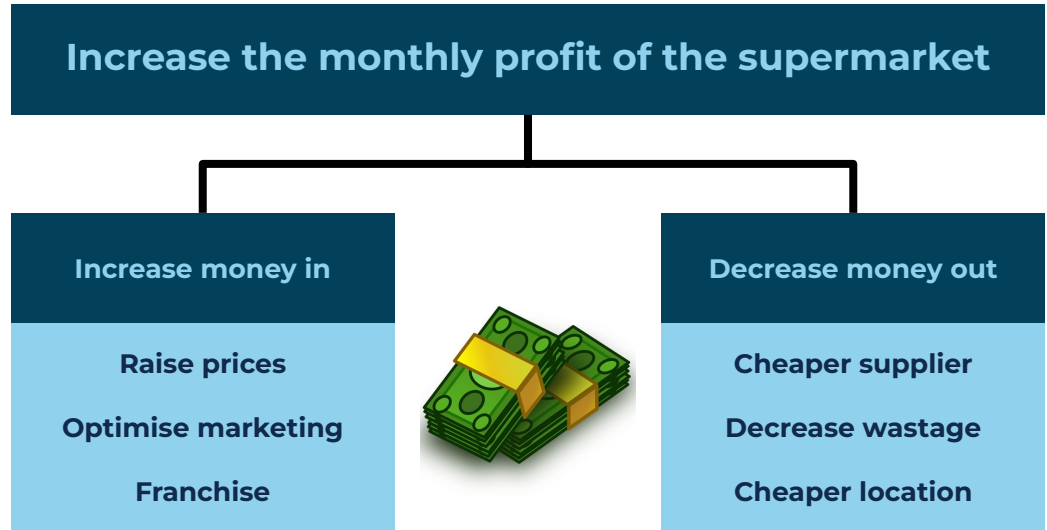
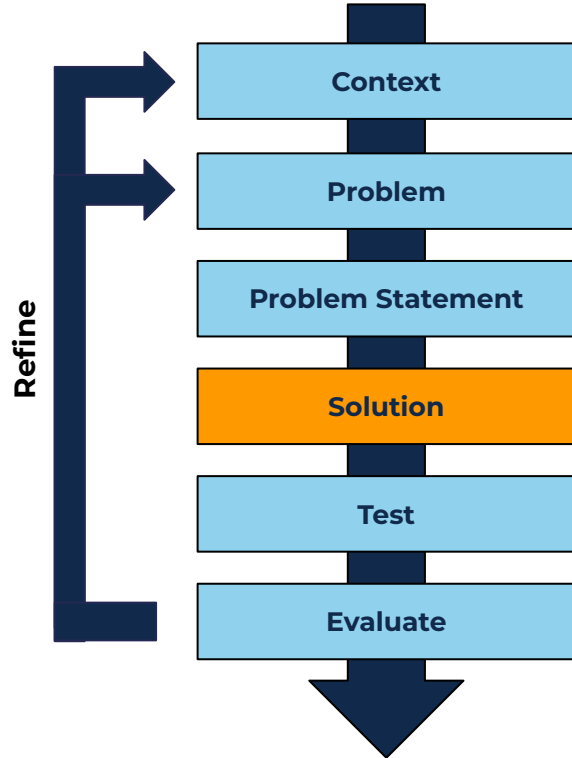


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Develop Solutions

“In the middle of difficulty lies opportunity.”

- Albert Einstein

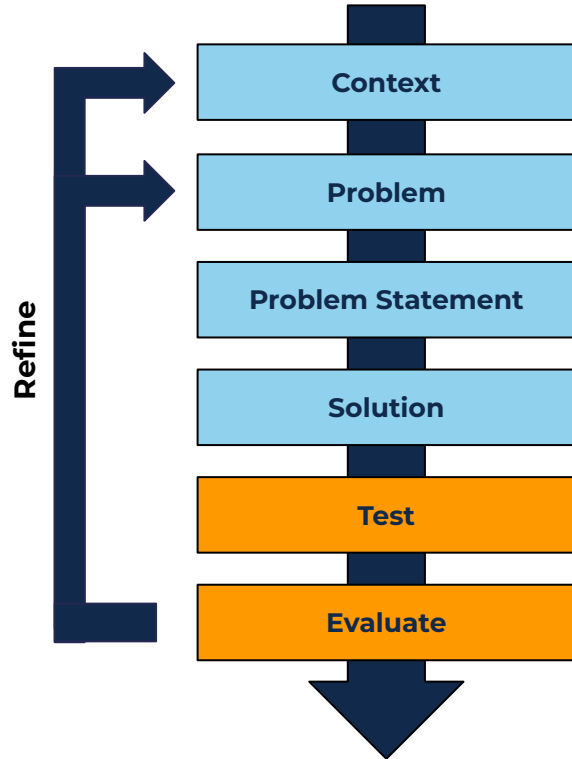


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Implement, evaluate, feedback and adjust

“Unless someone like you cares a whole awful lot, nothing is going to get better. It’s not.”

- Albert Einstein



- **Reflect** on process
- Was the problem **solved**?
- What **worked**?
- What **didn't work**?
- What could be done **better**?
- What's the **next step**?
- Part of **Agile Process**



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Problem Solved!



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Now it's time to apply this yourself in your groups

Scenario 2: Fish Finder

You are part of a Data Science and Machine Learning consulting firm. A nature conservation NPO approaches you with a problem. They are concerned with the size and composition of the fish population in a particular area, as they can be an indicator of the overall environmental health of an ecosystem. They want an automatic way to record the numbers and species of fish in a specific river. How do you do this in a way that minimises cost and maximises value for the client?

Data available:

An internet connected video camera mounted at an important fish ladder in the river, as well as an unlabelled database of images of various fish species from the area



EXPLORE

Now it's time to apply this yourself in your groups

Scenario 3: Netflix Ninja

You are a Data Scientist at Netflix. The programming division is trying to decide what show to make next and they have come to you for advice. How do you ensure that the show you suggest will be the next smash hit?

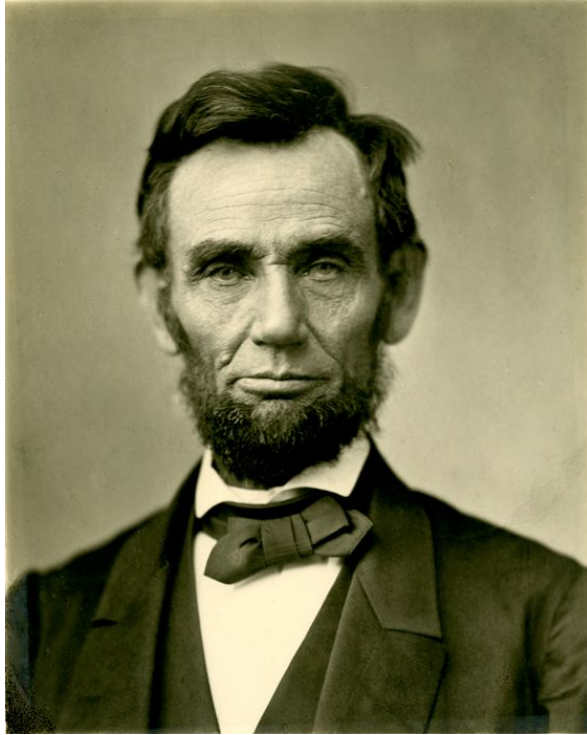
Resources/Data available:

You have the personal, location and watching habit data of all Netflix subscribers.



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One last thing...



“Don’t believe everything you read on the internet.”

- Abraham Lincoln

There is a quote by Albert Einstein on almost every slide of this presentation. Do you believe they’re true?

Albert Einstein is one of the most prolifically mis-quoted people in modern history.

Some of the quotes used were said by him, but others were not.

See if you can figure out which is which!

Bias and misinformation are everywhere! It’s your duty as a scientist to always be aware of it and to always be as truthful and accurate as possible.

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EXPLORE || DATA SCIENCE ACADEMY

Problem Solving Bootcamp

Case Studies

Now it's time to apply this yourself in your groups

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About the Nisqually River Foundation



- NPO
- Nature conservation
- Assist Nisqually Indians with watershed stewardship plan
- Approached [Gramener](#) to measure and monitor fish species in the Nisqually river



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Problem statement

Measure and monitor fish species in the Nisqually river in an automated technology-driven manner

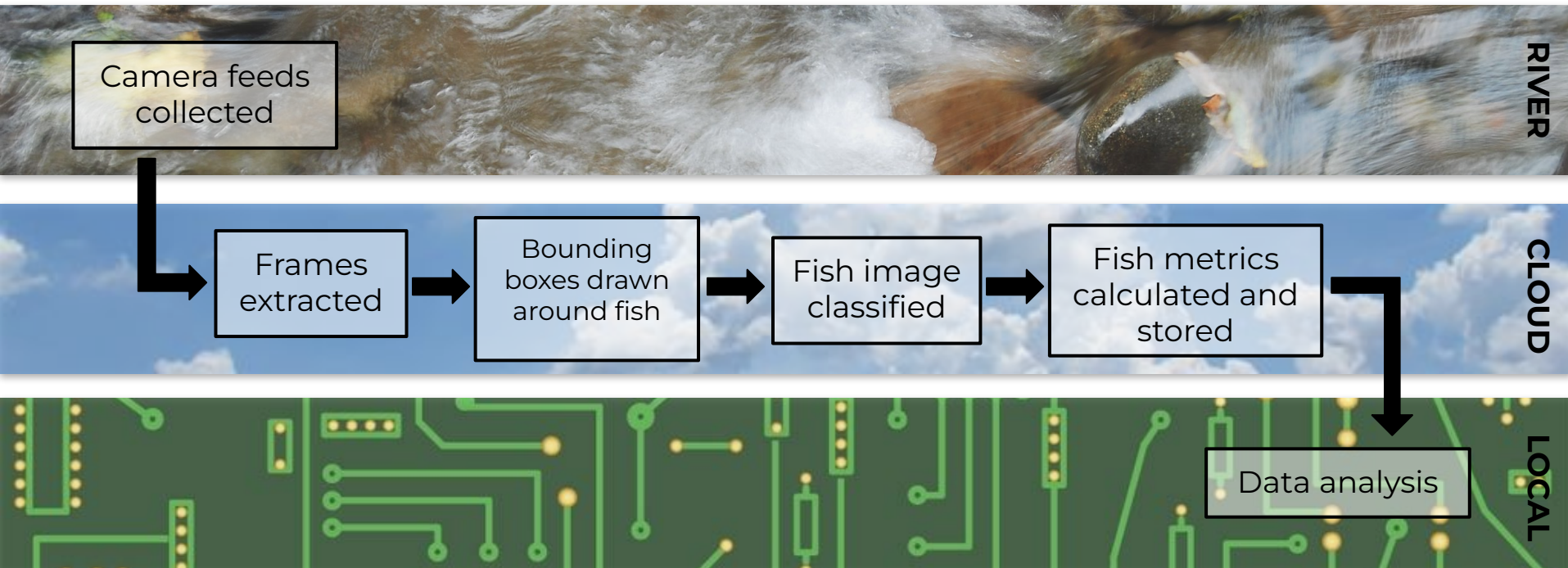
Mutually Exclusive

Identify discrete fish species
Count number of each species

Collectively Exhaustive

Captures entirety (or as close as possible) of fish population in river

Workflow



Deep Machine Learning



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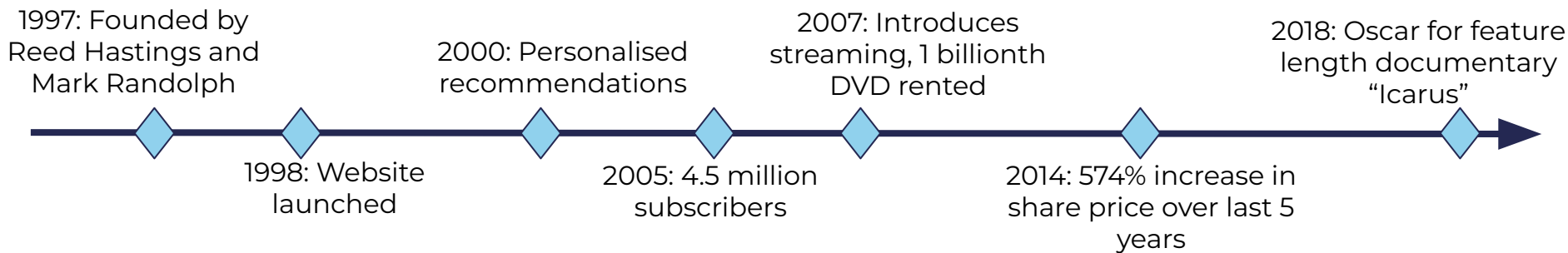
Resources/Data available:

You have the personal, location and watching habit data of all Netflix subscribers.



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Netflix: A brief history



Problem statement

Develop a show concept that will be popular among current Netflix subscribers and adult non-subscribers

Mutually Exclusive

Subscribers and adult
non-subscribers do not
overlap

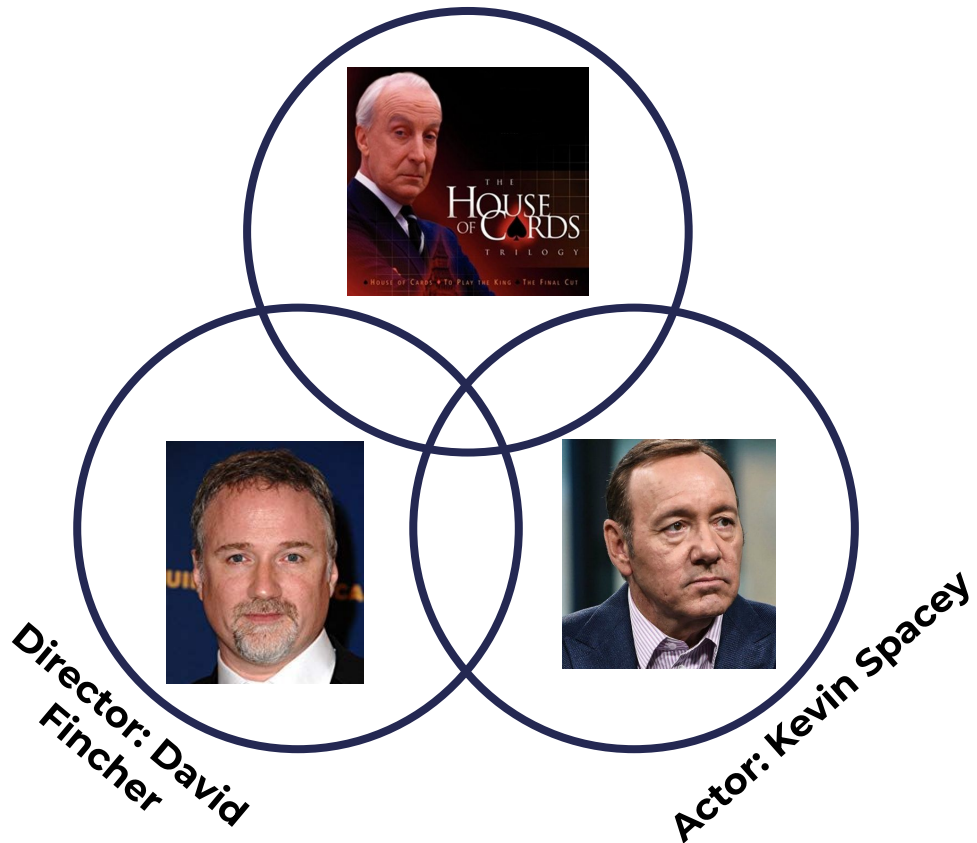
**Collectively
Exhaustive**

Captures the whole
potential market

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Viewership data

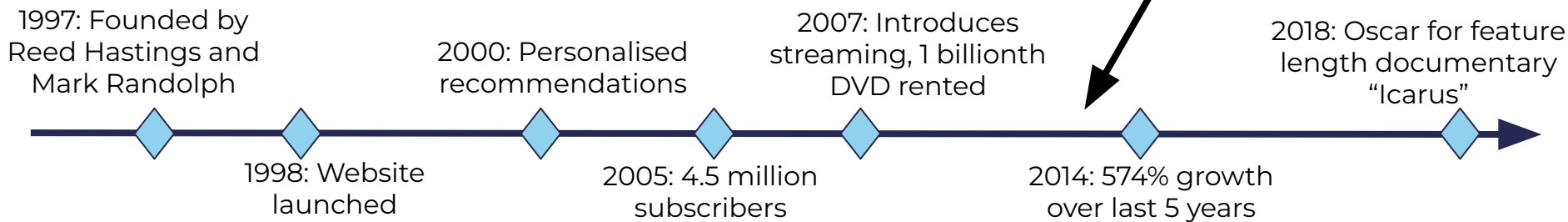
House of Cards (UK)





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Netflix: A brief history



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Resources

Netflix case study:

<https://nethosting.com/netflix-case-study-2/>

<https://medium.com/@JoshMangus/case-study-house-of-cards-9c6e5720bacf>

<https://www.idginsiderpro.com/article/3207670/how-netflix-built-a-house-of-cards-with-big-data.html>

Nisqually River Fish

<https://gramener.com/case-nisqually>

https://www.youtube.com/watch?v=LzdXpUAsO98&feature=emb_logo

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