COMP 3647
Human-AI Interaction Design

Topic 3:
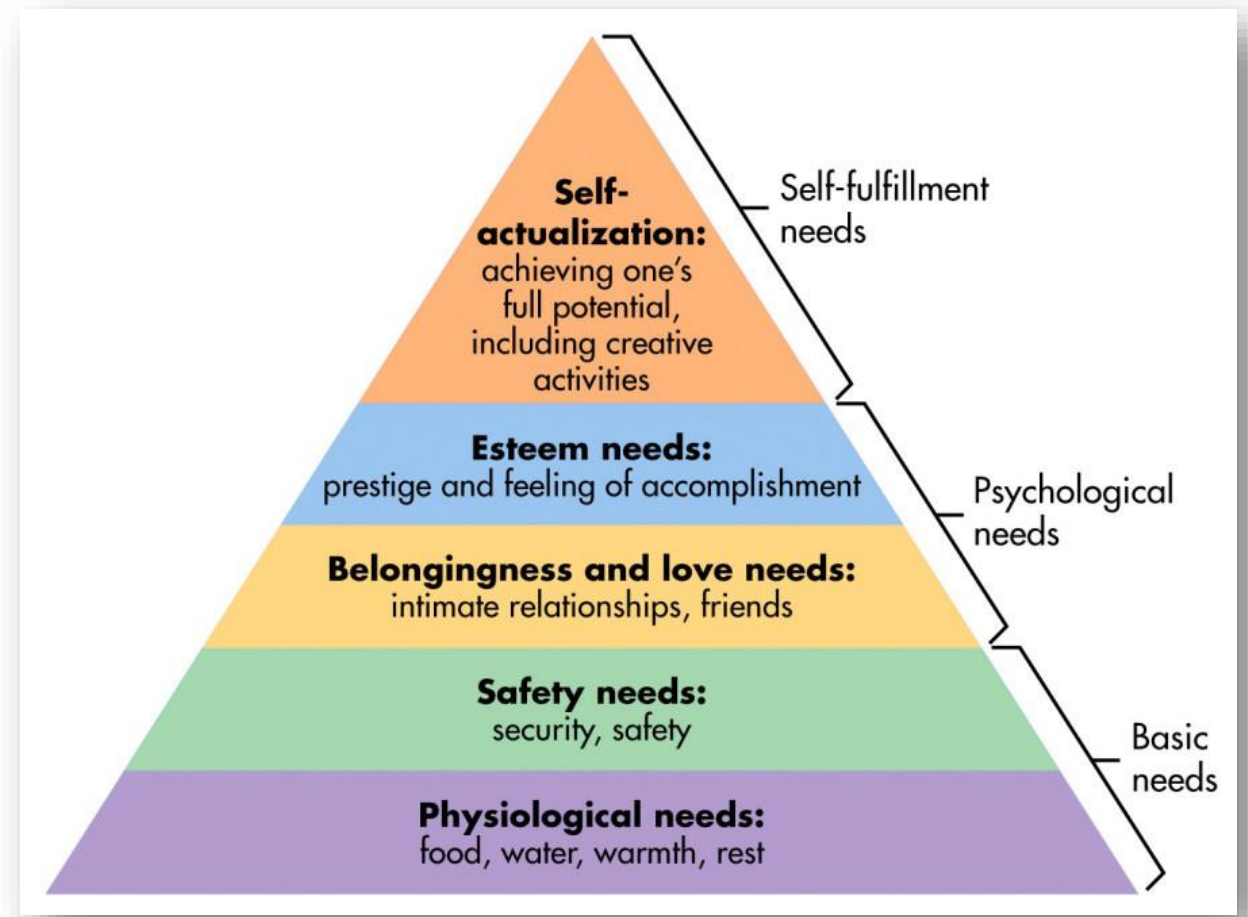## *User Needs*

Prof. Effie L-C Law

User Needs: Psychological Models

Abraham Maslow's Hierarchy of Needs (1943)

Motivation

Criticisms:
- Inconclusive empirical evidence
- Overlapping stages

Recent Theories of Human Needs

K. Sheldon et al (2001)Top 10 Human Needs

| #1	autonomy and independence	feeling like you are the cause of your own actions rather than feeling that external forces or pressure are the cause of your action
#2	competence and effectance	feeling that you are very capable and effective in your actions rather than feeling incompetent or ineffective
#3	relatedness and belongingness	feeling that you have regular intimate contact with people who care about you rather than feeling lonely and uncared of

TOP #10 HUMAN NEEDS
based on (Sheldon et al., 2001)

| #1	autonomy and independence	feeling like you are the cause of your own actions rather than feeling that external forces or pressure are the cause of your action
#2	competence and effectance	feeling that you are very capable and effective in your actions rather than feeling incompetent or ineffective
#3	relatedness and belongingness	feeling that you have regular intimate contact with people who care about you rather than feeling lonely and uncared of
#4	self-actualizing and meaning	feeling that you are developing your best potentials and making life meaningful rather than feeling stagnant and that life does not have much meaning
#5	security and control	feeling safe and in control of your life rather than feeling uncertain and threatened by your circumstances
#6	money and luxury	feeling that you have plenty of money to buy most of what you want rather than feeling like a poor person who has no nice possessions
#7	influence and popularity	feeling that you are liked, respected, and have influence over others rather than feeling like a person whose advice or opinion nobody is interested in
#8	physical thriving and bodily	feeling that your body is healthy and well-taken care of rather than feeling out of shape and unhealthy
#9	self-esteem and self-respect	feeling that you are a worthy person who is as good as anyone else rather than feeling like a „loser"
#10	pleasure and stimulation	feeling that you get plenty of enjoyment and pleasure rather than feeling bored and understimulated by life

User Experience (UX) and Needs Fulfillment

Usability → Pragmatic Quality (productivity)
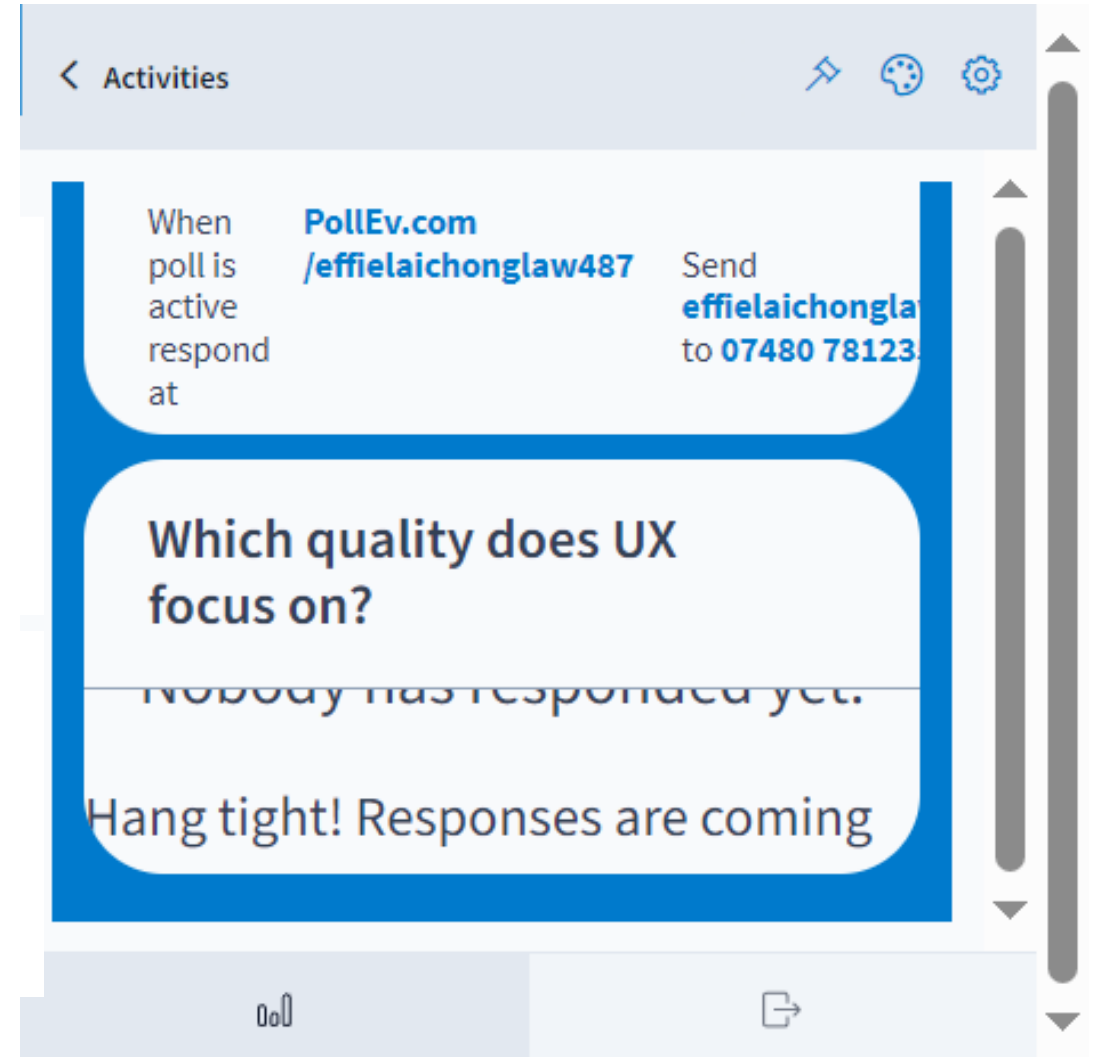User Experience → ███████ Quality (pleasure)
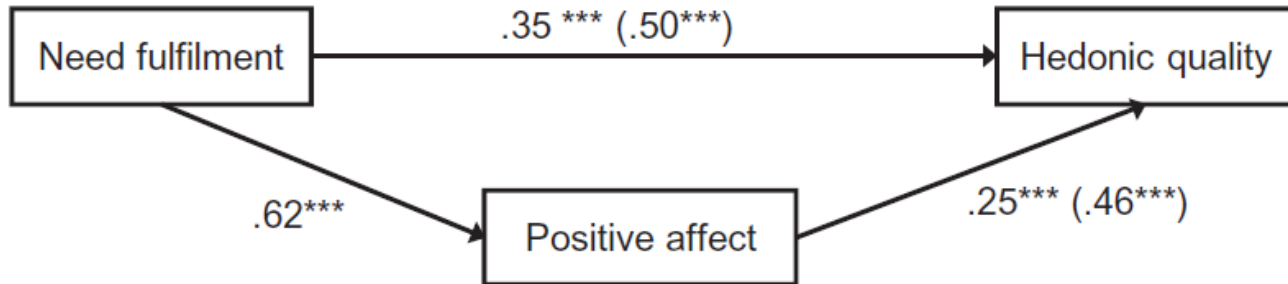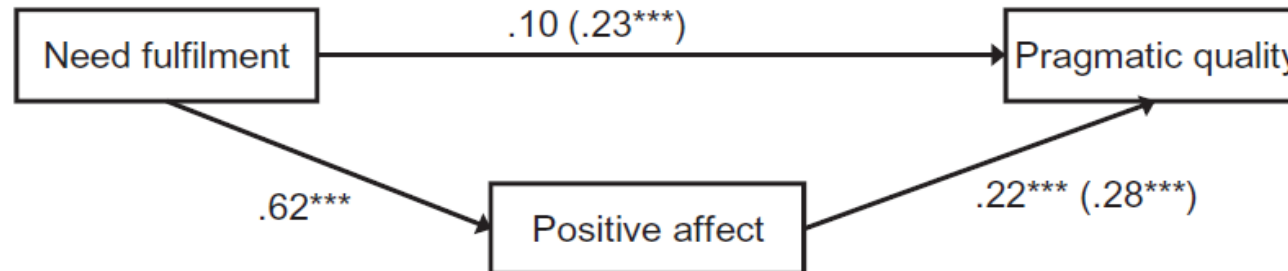
Hassenzahl, M., et al. (2010)

From UX to AI: What's new about user needs?

Know People's Needs First ... Offer Helps Next:

A Case Study on Online Banking Apps

Online Banking

How many physical bank branches have been closed since 2015?

Online Banking

How many bank branches have closed since 2015?
5,579, at a rate of around 54 per month.

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Lloyds Bank branch closure will hit 'elderly and vulnerable'

10 August 2022

SAVE OUR BANK
Don't close our branch!

LDRS

BBC Breaking News ✔
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Banking giant HSBC to close 114 branches in UK from April 2023 as customers increasingly bank online

HSBC UK

BBC NEWS

B   Business ...   ‹   ›   ⋮   ✕

NatWest

Full list of 23 NatWest branch closures happenin...

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Mind the Gap

FCA: Basic financial services are available to vulnerable, digitally excluded parts of society in physical branches rather than online only.

Financial Conduct Authority (FCA) (2022). Branch and ATM closures or conversions. *Finalised Guidance, FG 22/6,* October 2022.

The critical gap between online banking services provision and user adoption can be bridged by improving customers' trust in digital tools.

Chatbot Prototype

WARNING:
Please do not input your personal information
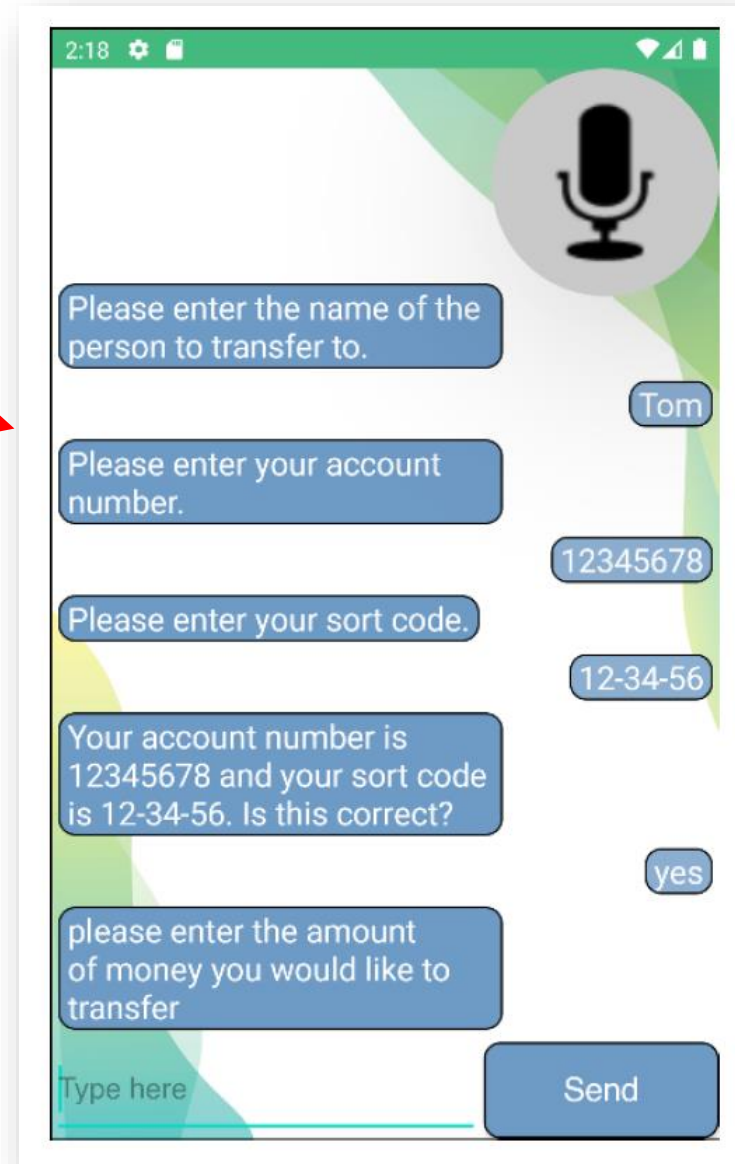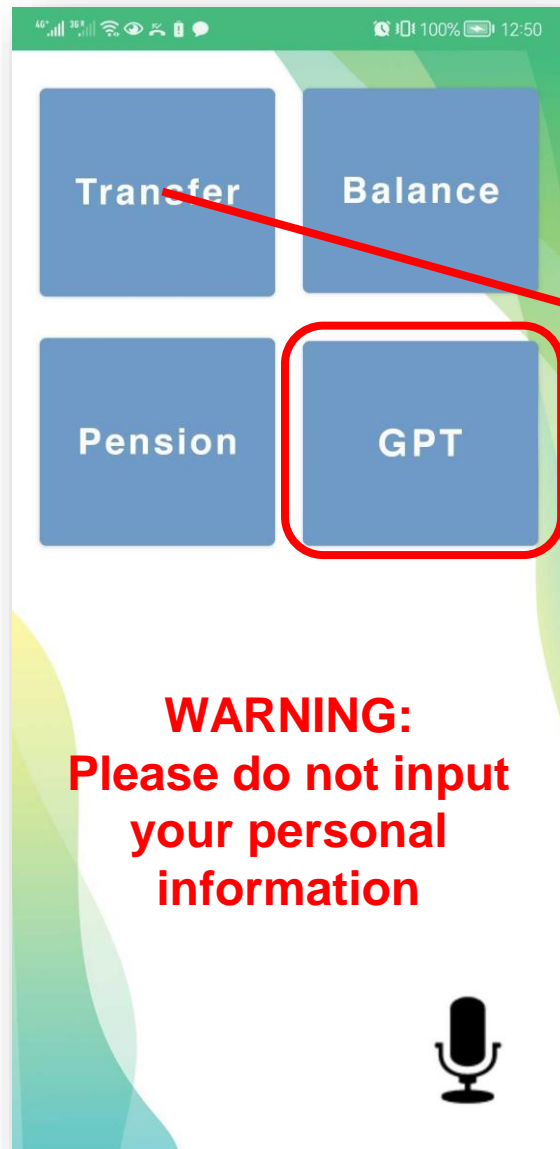
Human-Centred Design Approach
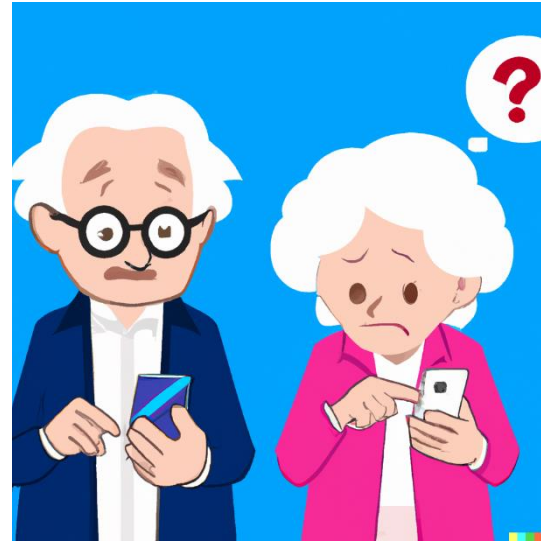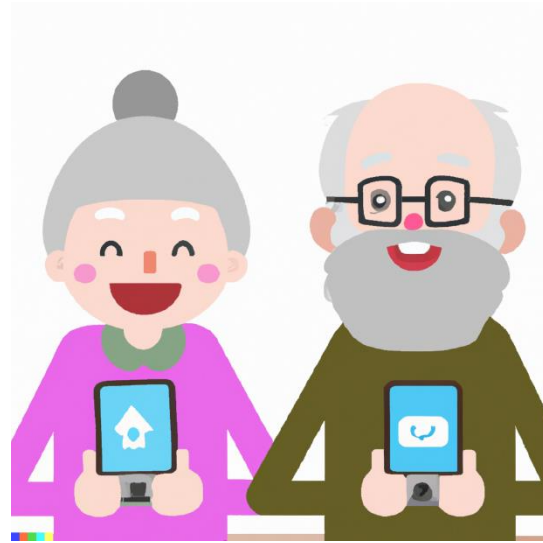
User Needs and AI

Even the best AI will fail if it doesn't address users' needs and values!

✓ Which user problem is AI **uniquely** positioned to solve?

✓ How to **augment** human capabilities in addition to **automating** tasks?
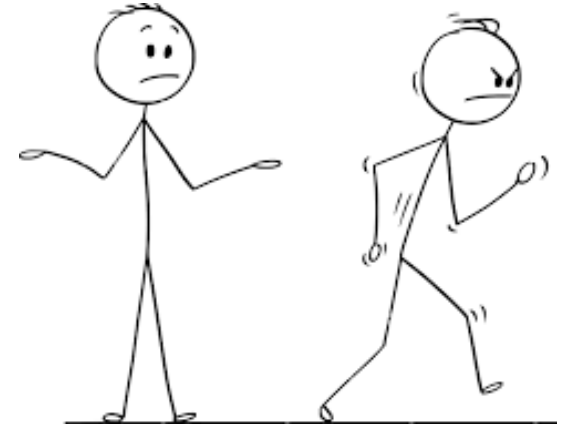
✓ How to ensure **reward function** optimises AI for the right thing?

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What's new when working with AI?

When building a product in a **human-centred** way, the most important **decisions** to make:

- Who are your users?
- What are their needs and values?
- Which problem should you solve for them?
- How will you solve that problem? How will you know when the experience is "done"?

It is important to understand:

- Which user problems are good candidates for AI, and
- How to define success.

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What's new when working with AI

Key considerations

- Find the intersection of user needs & AI strengths
- Assess automation vs augmentation
- Design & evaluate the reward function

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Find the intersection of user needs & AI strengths

Intersection of user needs & AI strengths

Human-Centred Design Process…

- The time spent identifying the right problem to solve is some of the most important.
- Talking to people, looking through data, and observing behaviours can shift our thinking from technology-first to people-first.
- The first step is to identify real problems that people need help with.
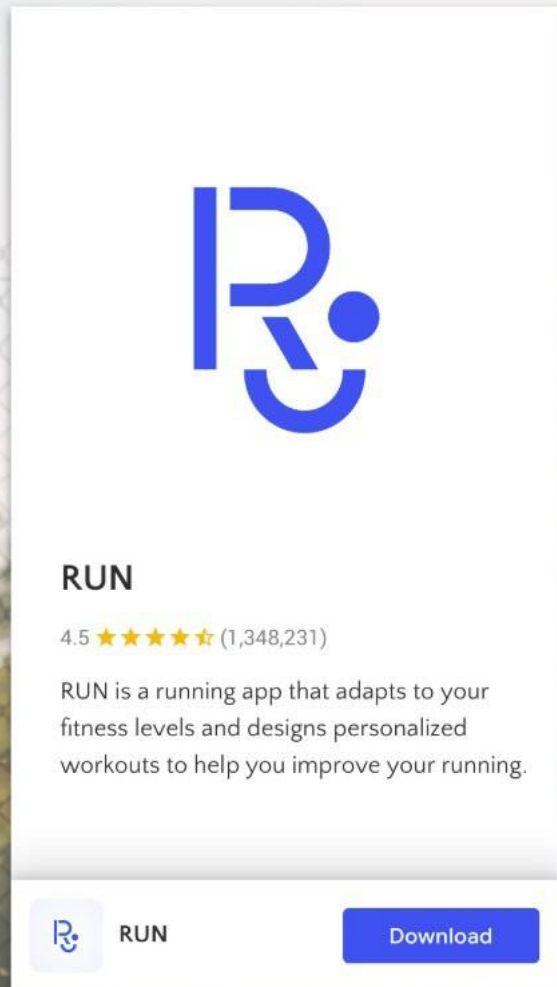
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RUN

4.5 ★★★★☆ (1,348,231)

RUN is a running app that adapts to your fitness levels and designs personalized workouts to help you improve your running.

RUN   Download
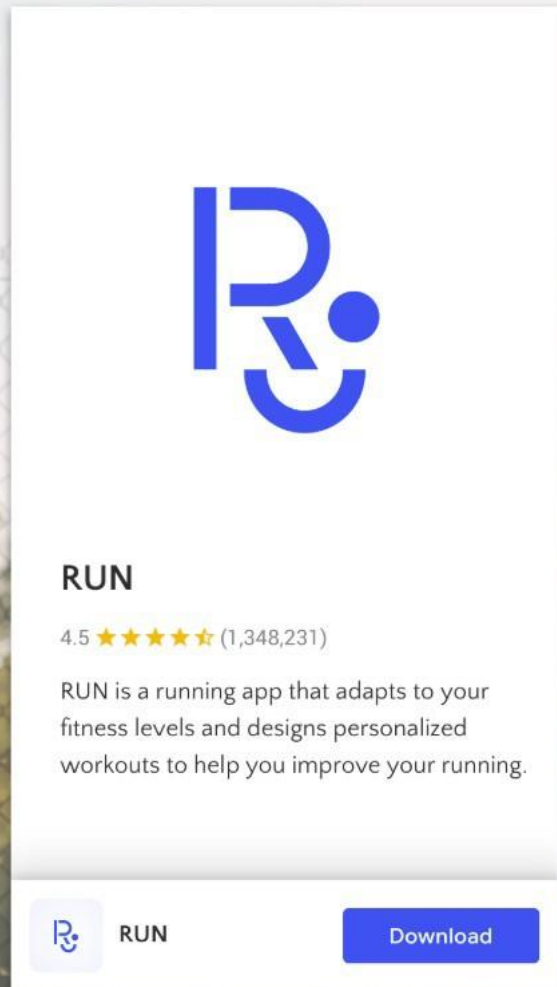
Always build & use AI in responsive ways.

Build with the greater good in mind!

- Get input from diverse users early on
- Hear different points of view

Intersection of user needs & AI strengths

1. Map existing workflows

2. Decide if AI adds unique value

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Intersection of user needs & AI strengths

1. Map existing workflows

To find opportunities for AI to improve the experience.

- What are necessary steps to complete a task?
- What aspects could be automated or augmented?

Already have a working AI-powered product?

- Test assumptions with user search.
- Let people use the product (or a "Wizard of Oz" test) to automate certain aspects of the process and see how they feel about the results.

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Intersection of user needs & AI strengths

2. Decide if AI adds unique value

- Which of the possible solutions require AI?
- Which are meaningfully enhanced by AI?
- Which solutions don't benefit from AI or are even degraded by AI?

AI vs. Heuristic-based solution

Heuristic-Based

Based on static if-then functions, or rules based on desired situation-result pairs. If a certain situation arises, the software produces a specific result, every time.

Intersection of user needs & AI strengths

2. Decide if AI adds unique value

When AI is probably better

- Recommending different content to different users.
- Prediction of future events.
- Personalisation improves the user experience.
- Natural language understanding.
- Recognition of an entire class of entities.
- Detection of low occurrence events that change over time.
- An agent or bot experience for a particular domain.
- Showing dynamic content is more efficient than a predictable interface.

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Intersection of user needs & AI strengths

Key Concept

Instead of asking "Can we use AI to _____?", start exploring human-centred AI solutions by asking:

- How might we solve _____ ?
- Can AI solve this problem in a unique way?

Assess Automation vs Augmentation

Assess automation vs Augmentation

When we've found the problem to solve and have decided using AI is the right approach…

Evaluate different ways AI solve problem and help users accomplish their goals.

Should we use AI to **automate** a task or to **augment** a person's ability to do that task themselves?

Some tasks, people would love for AI to handle, but there are many activities that people want to do themselves…

AI can help perform the same tasks, but faster, more efficiently, or sometimes even more creatively.

Automation and augmentation can work together!

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Assess automation vs Augmentation

When to Automate

Automation: when it allows people to avoid undesirable tasks entirely, or when the time, money, or effort investment isn't worth it to them.

Measurements of successful automation:
- Increased efficiency
- Improved human safety
- Reduction of tedious tasks
- Enabling new experiences that weren't possible without automation

The best option for tasks that supplement human weakness with AI strengths.

Assess automation vs Augmentation

When to Automate

Consider automating experiences when:

- People lack the knowledge or ability to do the task
- Tasks are boring, repetitive, awkward, or dangerous

Even when we choose automate a task, there should almost always be an option for human oversight – sometimes called "**human-in-the-loop**" – and intervention if necessary. Allowing users to preview, test, edit, undo what AI automates…

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Assess automation vs Augmentation

When to Augment

When people typically prefer for AI to augment their existing abilities and give them "superpowers" instead of automating a task away entirely.

Measurements of successful augmentation:
- Increased user enjoyment of a task
- Higher levels of user control over automation
- Greater user responsibility and fulfilment
- Increased ability for the user to scale their efforts
- Increased creativity

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Assess automation vs Augmentation

When to Augment

Augmentation is not always easy to define as separate from automation, but usually more complicated, inherently human and personally valuable.

Example: we may use tools that automate part of designing a t-shirt, like resizing your art or finding compatible colours. The design software, in this case, augments the task of t-shirt design, and unlocks limitless ingenuity.

Assess automation vs Augmentation

When to Augment

Consider augmenting experiences when:

- People enjoy the task
- Personal responsibility for the outcome is required or important
- The stakes of the situation are high
- Specific preferences are hard to communicate

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Assess automation vs Augmentation
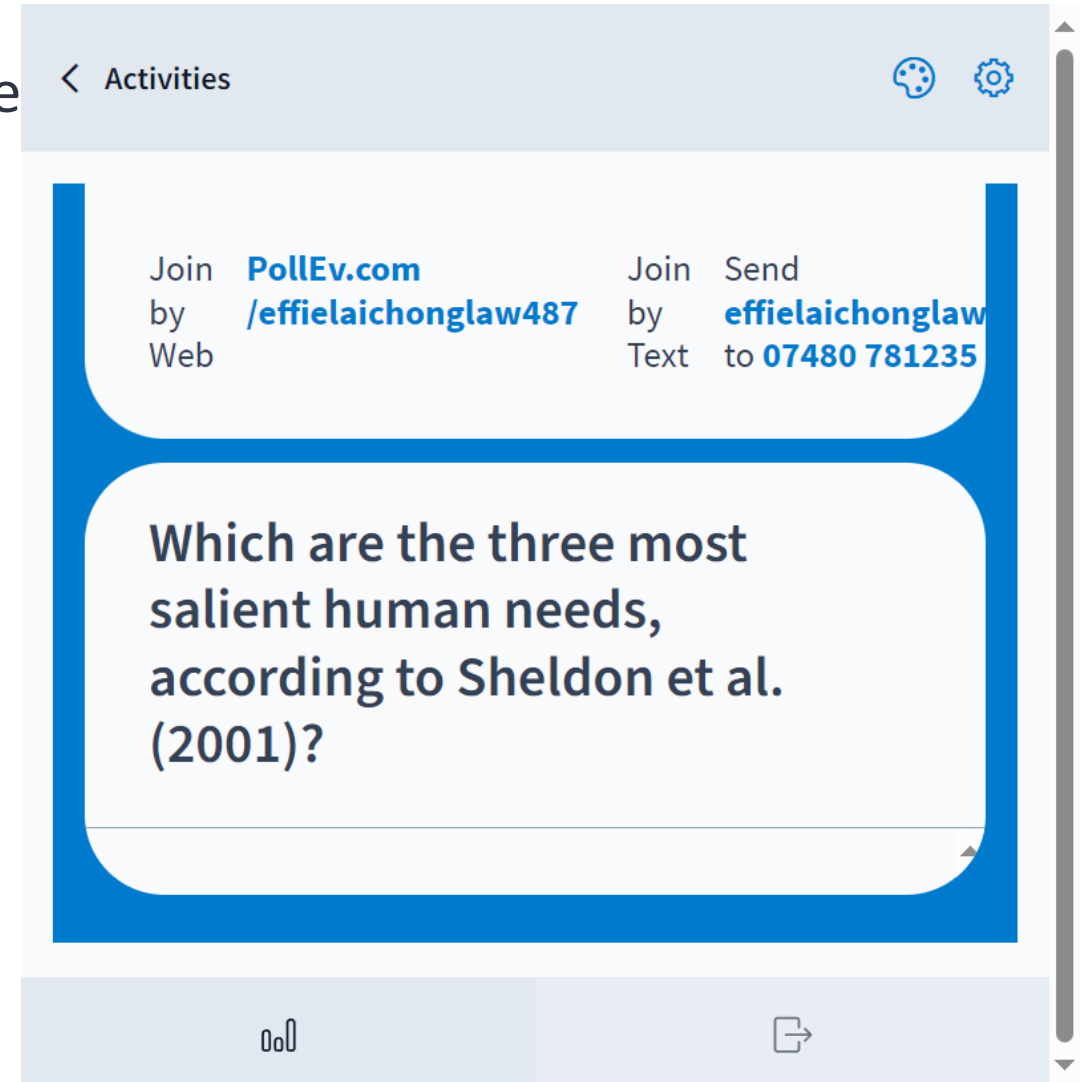
Key Concept

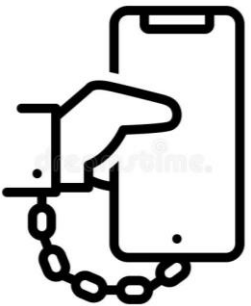Example research questions to ask users and know how they think about automation and augmentation:

- If you were helping to train a new co-worker for a similar role, what would be the most important tasks you would teach them first?
- Tell me more about that action you just took, about how often do you do that?
- If you had a human assistant to work with on this task, what, if any duties would you give them to carry out?

Assess automation vs Augmentation

Impact of Automation and Augmentation on the three main user needs (Sheldon et al. 2001)

- Feel dependent
- Feel incompetent
- Feel isolated

Activities

Join by Web **PollEv.com /effielaichonglaw487**

Join by Text **effielaichonglaw** to **07480 781235**

Which are the three most salient human needs, according to Sheldon et al. (2001)?

Design and evaluate the "Reward Function"

Design and evaluate the "Reward Function"

1. What is a "Reward Function"?

A mathematical formula, or set of formulas, that the AI model uses to determine "right" vs "wrong" predictions.

It determines the action or behaviour the system will try to optimise for and will be a major driver of the final user experience.

When designing reward function, we must make a few key decisions that will dramatically affect the final user experience.

Designing reward function should be a collaborative process across disciplines.

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Design and evaluate the "Reward Function"

2. Weigh false positives & negatives

PREDICTION

	Positive	Negative
Positive	☺ True Positive	☹ False Negative
Negative	☹ False Positive	☺ True Negative

REFERENCE

2. Weigh false positives & negatives

Run uses an AI model to recommend runs to users:

1. The model suggested a run the user liked and chose to go on.
2. The model did not suggest a run the user would not have chosen to go on.
3. The model suggested a run to the user that they did not want to go on.
4. The model did not suggest a run to the user that they would have wanted to go on if they knew about it.

1. True Positive
2. True Negative
3. False Positive
4. False Negative

Design and evaluate the "Reward Function"

2. Weigh false positives & negatives

When defining the "Reward Function", we'll able to "weigh" outcomes differently.

Weighing the cost of false positives and false negatives is a critical decision that will shape user experiences. To weigh both equally by default, but...

A **false alarm** worse than one that doesn't go off when there's a fire?

(both are incorrect, but one is much more dangerous.)

Occasionally recommending a song that a person doesn't like?

(maybe just simply skip it.)

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Design and evaluate the "Reward Function"

3. Consider precision & recall trade-offs

Describing the breadth & depth of results that AI provides to users and the types of errors that users see.

Precision

The proportion of true positives correctly categorised out of all the true and false positives. The higher the precision, the more confident we can be that any model output is correct.

However, the **trade-off** is that we will increase the number of **false negatives** by **excluding** possible relevant results.

Design and evaluate the "Reward Function"

3. Consider precision & recall trade-offs

Describing the breadth & depth of results that AI provides to users and the types of errors that users see.
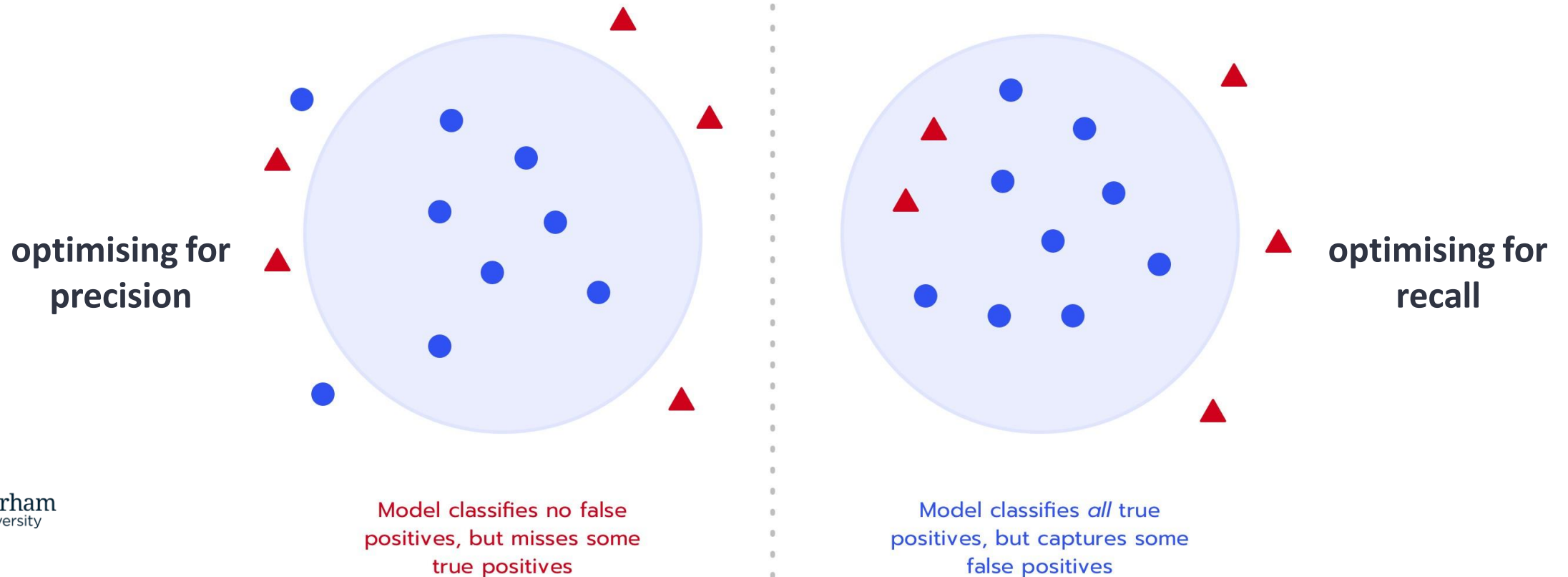
Recall

The proportion of true positives correctly categorised out of all the true positives and false negatives. The higher the recall, the more confident we can be that all the relevant results are included somewhere in the output.

However, the **trade-off** is that we will increase the number of **false positives** by **including** possibly irrelevant results.

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Design and evaluate the "Reward Function"

3. Consider precision & recall trade-offs

Describing the breadth & depth of results that AI provides to users and the types of errors that users see.

optimising for precision

Model classifies no false positives, but misses some true positives

optimising for recall

Model classifies *all* true positives, but captures some false positives

Design and evaluate the "Reward Function"

3. Consider precision & recall trade-offs

Need to design specifically for these trade-offs – there is no getting around them!

Where along that spectrum the product falls should be based on what the users expect and what gives them the **sense of task completeness**.

- Sometimes, seeing some lower confidence results in addition to all of the 100% results can help users **trust** that the system isn't missing anything.
- In other cases, showing lower confidence results could lead to users trusting the system less.

Make sure we test the balance between precision and recall with the **users**!

Design and evaluate the "Reward Function"

4. Evaluate the "Reword Function" outcomes

Don't tempt to make it very simple, narrow, or immediate.

Considerations when evaluating the "Reward Function":

- Assess inclusivity
- Monitor over time
- Imagine potential pitfalls

Design and evaluate the "Reward Function"

5. Account for negative impact

Impossible to uncover every potential pitfall upfront.

We should schedule a regular scheme for checking our impact metrics and identify additional potential bad outcomes and metrics to track.

Also useful to connect potential negative outcomes with changes to UX we could make to address them.

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Design and evaluate the "Reward Function"

5. Account for negative impact

Also useful to connect potential negative outcomes with changes to UX we could make to address them.

E.g., standards and guidance:

- If users' average rate of rejection of smart playlists and routes goes above 20%, **check our ML model**.
- If over 60% of users download our app and never use it, **revisit marketing strategy**.
- If users are opening the app frequently, but only completing runs 25% of the time, **talk to users about their experiences and potentially revisit notification frequency**.

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Assess automation vs Augmentation

Key Concept

Everyone on team should feel aligned on what both success and failure look like for feature, and how to alert the team if something goes wrong.

Here's an example framework for this:

- If **{specific success metric}** for __ {your team's AI-driven feature} {drops below/goes above}__ {meaningful threshold} we will **{take a specific action}**.

References

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Exercise

Exercise

If you were asked to design an AI system from scratch, consider the following questions related to user needs

o Objectives
  - What is the real-world problem that the app aims to solve?
  - How does AI add unique value(s) in solving the problem?
  - What task(s) are to be automate and what task(s) are to be augment?
  - How does the AI define success and failures?
o Target users
  - Who are the target users? (e.g., gender, age, location, education, race, social class...)
  - What are the geographical divisions/segmentations?
  - What are their interests and behaviour patterns? - attitudes towards the app & how they may use it; do they use the app every time/seasonally? Why do they use it?

Questions?