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Artificial Intelligence Driven Design.

By Joël van Bodegraven

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Brain food — Vol 4

Chapter 3.

MAKE

SOCIETY

SAFER WITH

DESIGN & AI

**This third chapter was
written by Sophie Hart,
Head Of Design at Vortexa.**

Chapter 3.

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Introduction.

In the first two chapters of the Artificial Intelligence Driven Design series we focused on what Artificial Intelligence and Machine Learning are and how you can use design to train AI.

In this chapter by Sophie Hart and the team at Qumodo, we get a unique deep dive into how design and AI are used to make society safer, supported by some interesting insights and real life cases.

Qumodo researches, designs and develops AI technology - their team of scientists, educators and technicians, work with public and private sector organisations across defence, security and law enforcement to make the world a safer place.

With ~~Power~~ AI comes Great Responsibility

Design and artificial intelligence are powerful tools that can be used to make the world a safer place. Over the last few years, there's been an upsurge in interest around AI technology and how it's used to analyse large volumes of data and provide useful insights. Those aware of its benefits recognise that it can help us be more efficient and accurate in our decision making; we can even train it to decide for us, like self driving cars taking us from A to B. This powerful technology is impacting every industry; from consumer to business to government.

When looking at common case studies on designing for AI, we often focus on consumer facing products such as the Roomba or Netflix, probably because their mainstream nature means increased user exposure and understanding

of their benefits. What isn't discussed as often (at least in the design world) is how AI is being used in industries whose primary focus is creating a safer society; industries such as law enforcement, online safety/moderation, and defence and security (for this chapter, we'll call them public safety industries).

As we're now at the very heart of a technological revolution, a criminal revolution is very likely to follow. Unfortunately, with many of the benefits the digital world brings, comes the risk of these technological advances being manipulated for bad. For example, chatbots could be used to scam people on a mass scale, or photos being manipulated to tell fake stories.

It's the responsibility of public safety industries to stay one step ahead in order to be able to deal with the scale and volume of these crimes, and to turn the data associated with them into actionable intelligence. AI, now more than ever, is the perfect technology to support this industry, and design is the bridge to its accessibility.

Where and how are groups like law enforcement, defence and security currently applying AI?

Teams at the leading edge are starting to use AI for intelligence gathering and decision support. Just a few examples of what they're using are:



Powerful search capability to explore and link data



Object detection and facial recognition to help find clues in images



Location intelligence to solve crimes as well as help with situational awareness in areas of conflict or natural disaster



Chatbots to help make data exchange effortless and natural

Controversially, there is some interest in looking at predicting crime with AI. This is a rocky area as it's very hard to provide a machine with sufficient data about a person to make an accurate prediction. If you don't have enough data, you have to generalise, and this leaves room for bias, which could potentially be unfair or unethical.

While the industry knows how to capture, manipulate and interpret this data, the practical application of it is more complex. This is the most critical time to get it done right - as the consequences for getting it wrong, as you can imagine, are far graver than Netflix suggesting a film you don't actually want to watch.

Designers need to play a significant role in shaping these systems. Typical decisions designers make shouldn't just involve regular design and UX considerations, such as "Is the brand and company purpose being communicated effectively?" or "Can users navigate the system or site easily and efficiently?" Users in public safety industries often have to make critical decisions under intense time pressure or in dangerous environments, and therefore working with interfaces that have clear visual hierarchy is even more important than in other cases.

Additionally, they may not be hugely familiar with AI, and so it is the designer's responsibility to get them to engender their trust in the system; to communicate enough about the processes undertaken and demonstrate transparency around how the AI has suggested a decision, so that the user is encouraged to work with it. This is how the AI can be exploited to its fullest, and in these industries this is of paramount importance as people's lives are often at stake.

Design and Psychology at the heart of what we do

At Qumodo, we're building AI powered tools for our customers, all with the aim of making the world a safer place. Ben Gancz, who started the company, was previously a detective for the Police and also worked in an R&D team for the UK government. During that time he saw teams trying to set up new tech that used AI, and while they were enthusiastic about the new technology, he also saw a noticeable drop off in adoption due to the poor design and experience of the tools. They were treating it like a traditional computer that does what it's asked and were put off when it did weird things.

People often expect and trust machines to work and be binary – to be factual 100% of the time. However, machine learning is just that; a learning technology that must be taught. A new type of relationship needs to be built between humans and intelligent machines, **people need to understand the machines’ intentions, its limitations and abilities**. Any technology using machine learning must be given time to develop, and during that time it needs to be allowed to make mistakes. Those mistakes must then be highlighted, so that the AI learns to make them less and less frequently, and eventually not at all. Drop off in usership is highly likely when the necessity of this process isn’t clearly communicated, meaning that if a system proves unreliable in the first instance, people give up.

To prevent this, a tool should be designed to demonstrate how it has reached its conclusions, in order for users to trust it appropriately. Trust doesn’t need to be inextricably linked to the reliability and maturity of a system, as long as the limitations are explained and understood to be temporary. A user can then appreciate that in certain

instances their role is to contribute their decision making expertise to make up for where the machine falls short, meaning overall the system can better itself and become more reliable, resulting in an impressive and effective human machine team.

The importance of conveying risk responsibly

Some of the important decisions made by people in public safety industries include finding victims of child abuse, determining whether or not someone should be incarcerated, or how quickly teams should be deployed under the threat of a terrorist attack. Therefore, the speed and accuracy of the information provided to them is extremely important, which is why AI can be so beneficial. While timeliness is important, the decision maker should

also be provided with a fully informed, holistic version of the story - they need to be shown evidence of the reliability of the source.

Design can help to convey *appropriate* trust by showing the user information such as:

AI confidence - this can be done with percentages, ratios, traffic light systems and more

Sources - naming exactly where the data has been pulled from, consider if it's already well known and trustworthy to the user, also ensuring it has been extracted from an appropriately diverse range of sources

Human driven recommendations - who else has read, suggested or contributed to the information? What is the volume of confirmation from other sources?

Regular feedback - in response to input from the users, setting expectations.

Through rapid prototyping and working directly with users, you should be able to find the sweet spot with building tools that help with quick decision making, but also clear enough that it is accurate and considered.

The familiarity of a tool is also very important for designers to consider. In his book, *Hooked: How to Build Habit Forming Products*, Nir Eyal talks about 'Triggers, Actions, Rewards and Investment' - basically tips to consider when building compelling, enjoyable and addictive digital products. For public safety industries, this is just as important as it is in any other industry, however finding a balance between habit-forming and retaining high levels of user attention is key. Users need to be encouraged to keep their critical thinking hats on, and not allow their attention to dwindle. For example, a moderator could be tasked with categorising child abuse imagery - if the AI gives them a false sense of comfort and ease, they could fall into a trap and get lazy with the task, feeding the system incorrect data, in turn making an algorithm less reliable. The system can only learn what it has been taught.



Hurricane Irma

Saint Martin

Last updated Today 10:32, 06/09/2017

Rapid AI Map summary

TO ASSESS

19,435 buildings detected

45 Missing	5 New	8
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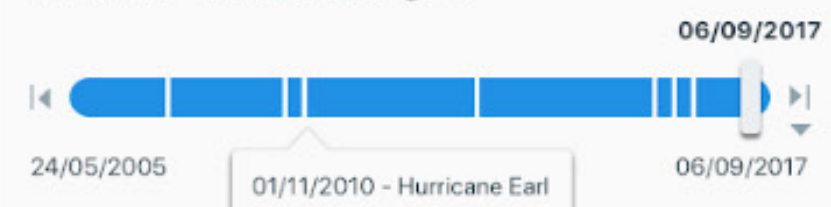
4,597 footways detected

6 Missing	3 New	4
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AI CONFIDENCE



Timeline - critical changes



Modify date range

Imagery info

Source: Open Street Map
Date: 06/09/2017, 06:30

Edit



Editing history



Today, 06/09/2017

Yesterday, 05/09/2017

CTR + T to toggle

2km | 18.0646387, -63.1168161

Situational awareness and rescue: Rapid AI Map

Rapid AI Map is a tool that was first conceived a year ago at a hackathon run by the UK Ministry of Defence (MoD). They wanted a system to help Geospatial Analysts produce up-to-date maps for search and rescue operations, such as in the aftermath of tsunamis, hurricanes and earthquakes. Although Google Maps may be very useful to the average consumer, according to techwalla, Google Maps is only updated every one to three years - a timeframe that is not sufficient for troops who have been flown into areas of unrest or where natural disasters have occurred. And while they also have access to satellite and drone generated imagery, they're unable to convert this into mapping information at speed.

This system automatically extracts mapping data from satellite imagery using machine learning. To start with, we focussed on the detection of new and missing buildings and roads, as these were a high priority for the users. When awarded the work from DTSL (Defence, Science and Technology Laboratory), we conducted workshops to dig deeper into requirements. During these sessions we found that Geospatial Analysts were under a lot of time pressure and the current processes were very manual. We also discovered that they had experimented with other object detection algorithms before, however the issues with accuracy made the systems feel unreliable and more effort to correct than it was worth.

To overcome this, machine learning was used with a human in the loop to help improve its performance over time, rather than just straight forward machine vision (object detection and classification) processes. Design considerations taken into account include:

Confidence: A traffic light system, as well as percentages are used to display its confidence in its decision making (in this instance, recognising buildings and roads). The user can quickly identify what it's certain in by seeing areas of green.

Feedback: The system asks the analysts to help assess what has happened to the buildings and roads it is less confident with, and quickly confirm whether they're missing, new or need to be edited. This feedback improves the quality of the data, making the algorithm more and more accurate over time.

Collaboration: Team members can add qualitative notes, and see who else has contributed to the assessment and editing of the vectors generated by the algorithm.

Reliable sources: Geospatial analysts are familiar with OpenStreetMaps and we will provide links to new sources of data, such as satellite imagery from other companies. We've also included information about the algorithms used, if they are particularly concerned or interested in the technology. Intelligence and evidence gathering:



Intelligence and evidence gathering: Qumodo Discover

Qumodo Discover is an evidence search engine that uses AI to help analysts and investigators unearth clues in their ever-growing databases of digital media. The system is currently being tested and used by the UK Police for child abuse investigation, and can also be used for other crimes such as terrorism and fraud.

Our primary focus was to keep the tool as simple to use as possible. These days, the concept of search is second nature to us, but behind the scenes, there is a lot of work that goes in! In the early days, we were lucky to receive a design grant from InnovateUK to give us a bit of breathing space to do our research properly (Tip: both

government and the business world are starting to notice and appreciate the ROI on design. Keep an eye out for funding opportunities in your country, there's probably more than you think!). During the initial research phase, we had a head start, as the Founder Ben was a relatively fresh "user" in the space from his detective days. We also gathered a team of analysts and investigators from other industries to help us make the tool as wide reaching and useful as possible, designing a search tool to:

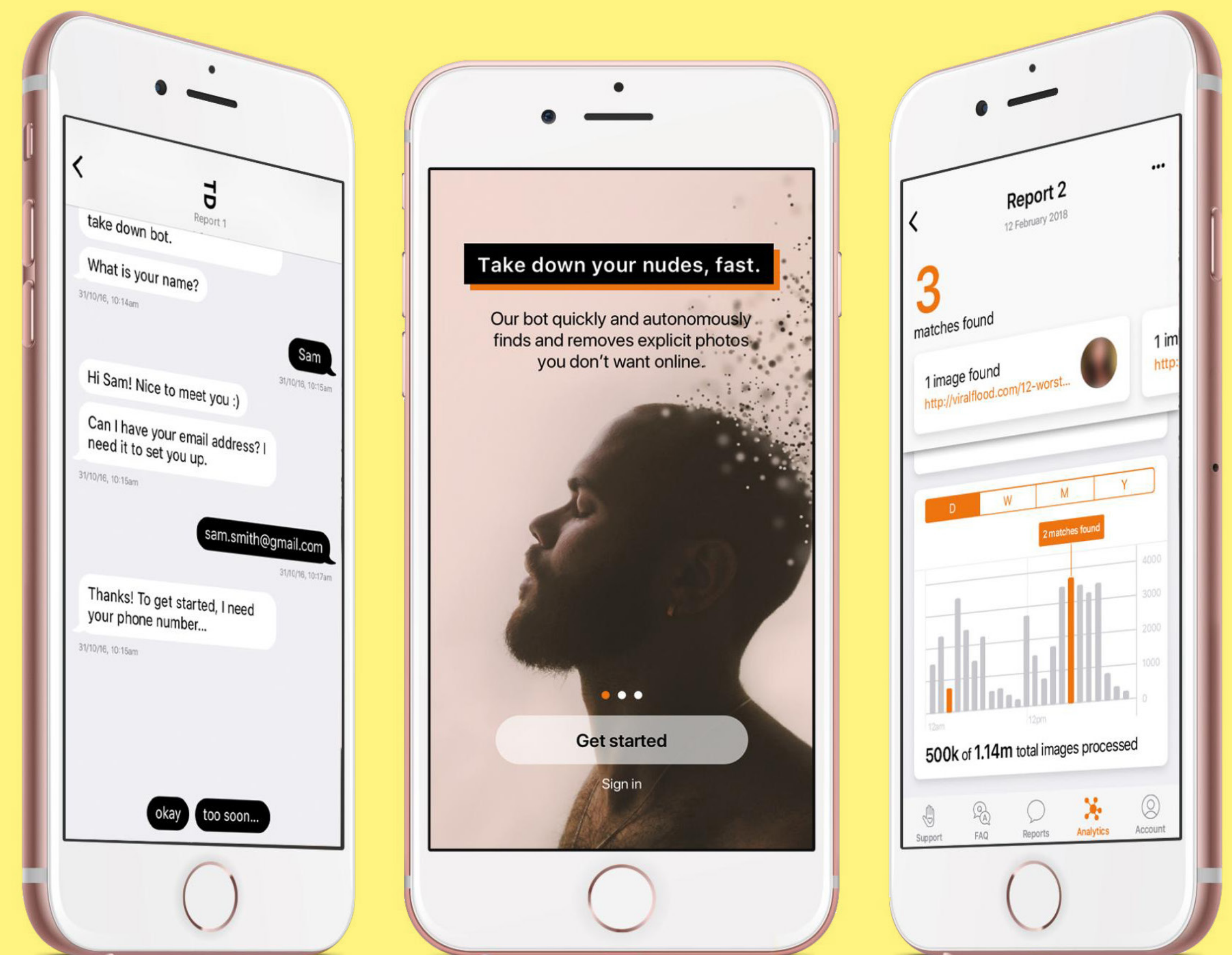
Understand the facets of data - take the time to discover every parameter and possibility of the data so you can help extract what's useful for the user. If you also keep abreast of AI techniques, you'll be able to think of new and interesting ideas to combine the two.

Find common search patterns and themes - if you've played cluedo before, you'll know that most investigators are looking to string together a story about an event. identities, locations, times, objects, sources etc. Imagine if you could search for Professor Plum holding the candle stick, busted!

Interesting results – after understanding the parameters of the data and doing user research, our team – which is a hybrid of users, data scientists, designers, developers, psychologists – tinker with what to show, what not to show, what to do with false positives and so-forth.

Show the magic upfront – this was a wise tip from InnovateUK. If you have some “secret-sauce” that is significantly more effective than their current method of doing things, facilitated by AI, show them as quickly as possible. This new method might require some onboarding, but good UX can teach the user what to do.

California sushi roll UX – In contrast to the point above, Nir Eyal (as previously mentioned) has a great analogy for how people in the US started to love sushi, have a read [here](#). The main concept was “people don’t want something truly new, they want the familiar done differently.” People are used to nice, clean search interfaces – no need to reinvent the wheel.



TAKE-DOWN

Digital assistant: TakeDown

TakeDown is an app that is currently in its research and development phase. It uses AI to empower individuals to regain control of their self-produced explicit images. It's been recorded that 88% of self-produced explicit images are shared on without the subject's consent. Whether an individual knows someone has shared an image of them without consent; they are concerned someone has or will do in the future; or they themselves have accidentally shared their image and are worried about where it might end up, TakeDown is designed to help them.

In the first instance the app will focus on the removal of self-produced explicit images from social media platforms; and then tackle other content sharing sites. Our motivation is not just the product itself, but to educate individuals about the importance of consent when sharing content

of others, as well as access to other support and information for our users.

We're hoping that this tool will not only help victims, but many other entities that are interested in this crime, including NGOs, police, schools, parents, researchers, web-hosts and social media companies. The success of the tool is dependent on **the balance of trust between the people involved and the technology supplied**. So far, we've developed a version 1 prototype, but going forward, these are the things we'll take into consideration:

Appropriate trust and expectation setting - the system uses a chatbot to help explain to the user that firstly, it's not a human, but also explains clearly what it can and can't do. Flexibility a typical form lacks.

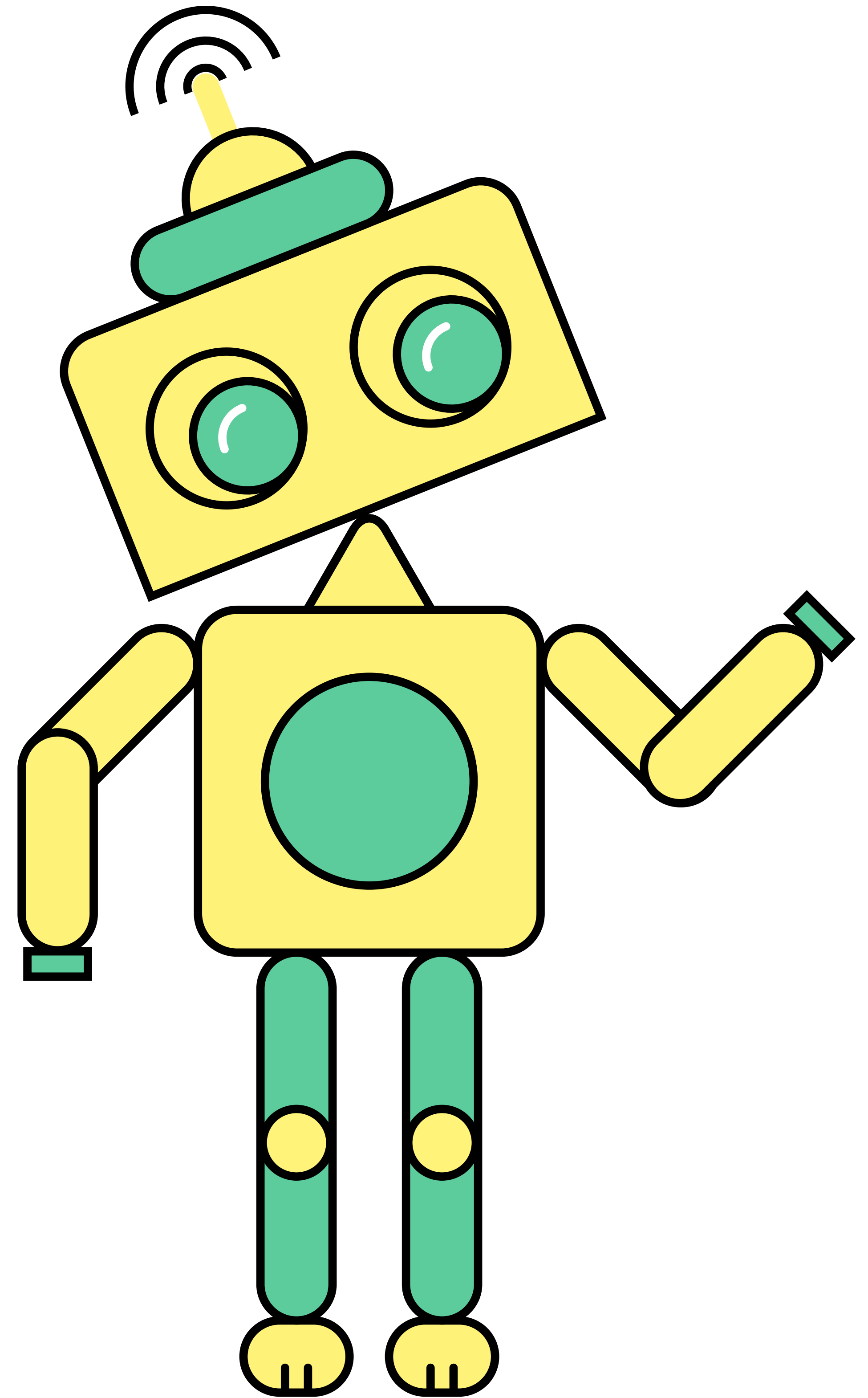
Tone of voice - with such a diverse audience who are in a particular state of mind when approaching the app, the tone of the chatbot is critical.

The hand over of responsibility between humans and technology - during this research phase, we're looking deeper into when people feel comfortable with humans getting involved, and when they'd rather just communicate with a machine.

Security - imperative in all technology companies, but particularly in a tool like this, we're exploring finding the right balance of making the tool as secure as possible, while remaining accessible to all users.

Brand reputation - at a time where there is a spotlight on responsibility of data handling, we want to be seen as accessible, understanding but most importantly, reliable.

Partnerships - working closely with social media companies, NGOs, police and more will make the app more efficient and effective. They will help us to build robust evidence data bundles that they trust so we can remove more humans from the process.



Opportunities are expanding with devices

There has been a gadget explosion over the last five or so years. Technologies like VR and AR have moved further along in the [Gartner Hype Cycle](#) and the hardware is finally here to support it. It's our responsibility as designers to upskill, or at least understand at a high level, what these gadgets can do and what frameworks are needed for them.

While there are some seriously exciting new tools out there, desk tools and 2D software are still dominating the business and government worlds. It's important to continue to make this experience great, as it's likely to have the biggest impact in the present.

Having said that, introducing a new capability (à la the California Sushi Roll method) that is easy to learn and understand, such as 3D and touch screen elements, is a good way to bring users on the journey. In defence, VR, AR and digital twins are becoming increasingly popular, however rigorous testing needs to be done to assess whether it actually speeds up a decision maker's accuracy and speed, or whether a "deeper" experience is actually too overwhelming, maxing out their cognitive load.

If you've spent most of your career building beautiful websites and slick consumer apps, you may not have needed to think too deeply about the human-computer-interaction (HCI) aspects of what you're designing. But in law enforcement, defence and security, this is really important. For example, unless fully tested and verified, most soldiers won't wear gloves on the battlefield with capacitive touch, preventing them from using touchscreens. Some other design considerations for the military include:

- Using dark screens to help save battery
- If someone is being shot at, is glass near the face a bad idea?
- How high-stress is their environment? Is the interface you're designing simple enough to be fool proof? Are the buttons big and clear enough at a glance?

More than ever before, **design teams need a diverse range of skills and specialties to help their businesses and customers be ahead of the curve.** Looking back at the Hype Cycle, I'm curious about smart dust, it's so 2030!

Conclusion

In summary, when it comes to protecting society, AI is a powerful tool that can help to augment user abilities, but it is important for people to clearly think through how these tools are designed.

There's still a lot of work to be done to convince the industry on why design is important - one way we can take steps towards this is by collecting statistics and sharing compelling examples.

When engaging businesses, government and the next generation about what makes the most powerful systems, we need to start talking about STEAM (science, technology, engineering, ARTS and maths) teams rather than just STEM. Diversity in thinking creates the most rigorous and interesting technology, which is critical when being used in high-risk situations. Every day **society is developing a greater reliance on machines, and design is central to bridging the gap.**

FOLLOWING CHAPTERS

This Brain food series will be released chapter-by-chapter, stretched over several months. In every chapter experts will dive deeper into specific topics related to AI.

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