

Human/AI Interaction: A Necessary Union

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Success isn't only efficiency

EFFICIENCY

How efficient are we?

How much faster are we now that we're using AI?

ENGAGEMENT

How interested are we in our work?

How meaningful is our work to us?

EXPERTISE

Are people still building expertise?

Could they do the work if the AI got it wrong?

Adoption of AI



- Software Engineering
- Law Firms & Judicial Work
- Medical Diagnosis
- Transportation
- Robotic Surgery
- Personalized Learning
- Financial Modeling
- Wellbeing & Mental Health
- Agriculture
- Entertainment
- Scientific Research



Humans + Computers

Human Strengths

- Emotional Intelligence
- Adaptability
- Intuition
- Judgment
- Morality & Ethics
- Problem solving with limited data

Computer Strengths

- Fast & Accurate
- Does not get bored, tired
- Consistent, precise
- Handles predictable cases
- Pattern recognition in vast data

Human Limitations

- Cognitive Capacity
- Inconsistency
- Endurance & Errors
- Training
- Bias & Subjectivity
- Response Time
- Information Processing Speed

Computer Limitations

- Rigidity and inflexibility
- Data requirements
- Interface with System
- Transparency & Interpretability
- Amplified bias

Humans + AI

Human Strengths

Emotional Intelligence
Adaptability
Intuition
Judgment
Morality & Ethics
Problem solving with limited data

AI System Strengths

Fast & Accurate
Does not get bored, tired
Consistent, precise
Handles predictable & unstructured cases
Pattern recognition in vast data

Human Limitations

Cognitive Capacity
Inconsistency
Endurance & Errors
Training
Bias & Subjectivity
Response Time
Information Processing Speed

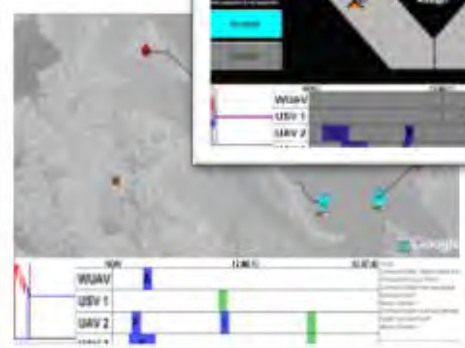
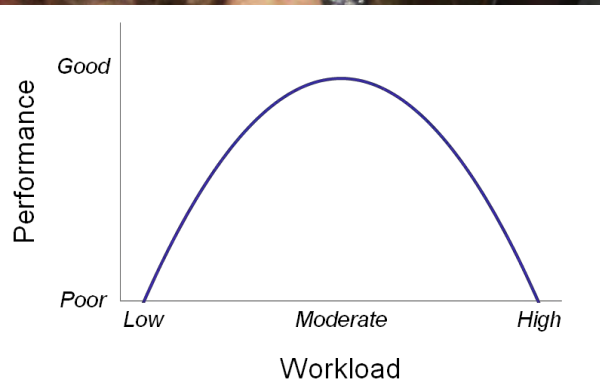
AI System Limitations

Rigidity and inflexibility
Data requirements
Interface with System
Transparency & Interpretability
Amplified bias
Confidently wrong
Overly Agreeable

Finding the right level of workload

Examples

- Adapting autonomy levels, change difficulty in games
- Modifying quantity of information
- Transform modality of information presentation
- Task allocation, manage task load, difficulty
- Offline evaluation of user interfaces, systems

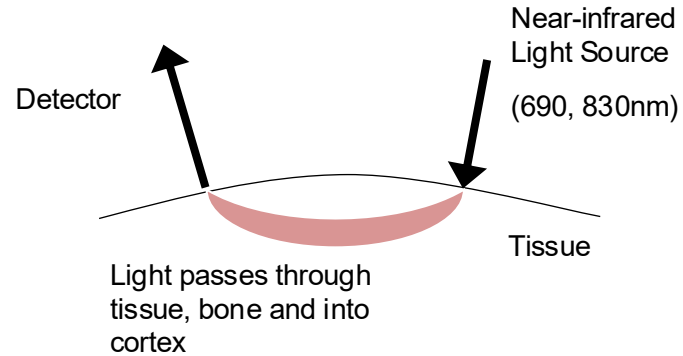
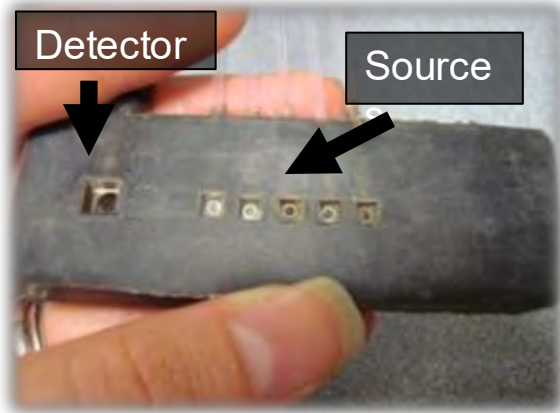




COMMUNICATION

Signals computers don't see

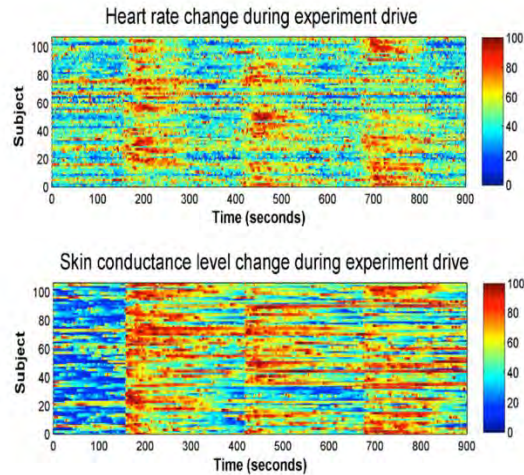
fNIRS: How does it work?



Functional Near-Infrared Spectroscopy



Example: Classifying Driver Workload Using Physiological & Driving Performance



Classify cognitive workload level

Solovey, et al., (2014) Classifying driver workload using physiological and driving performance data: two field studies. In Proc. CHI '14., 4057–4066.

Body sensor & task data as input

Real-world task, large field studies



“We can’t have a room of robots.”

Background & Motivation

- Justice systems worldwide are under pressure: rising caseloads, limited resources, and growing delays.
- Generative AI offers new capabilities—legal summarization, decision support, drafting judgments.
- But raises legitimacy concerns and risks undermining public trust if not carefully integrated.
- Need for human-centered design in AI for judicial contexts.



Methods

Three 60-minute semi-structured focus groups with 12 judges across the UK judicial hierarchy. This included:

- 5 Supreme Court justices
- 1 Court of Appeal judge
- 5 High Court judges
- 1 County Court judge

Sessions were held in-person at the UK Supreme Court and Royal Courts of Justice and online.

Ethical approval from Maynooth and Harvard.

The Value of Humans in Judicial Work

- Justice is rooted in human decision making and reasoning.
- The human component in justice holds value: provides emotional and psychological closure and a sense of dignity
- The value of the human component is case-dependent and role-dependent.
- Decision making is collaborative with multiple points of view.

Law is not a matter of pure logic. It's a matter of practical reasoning".

"People take comfort from having a human face, a human decision maker."

Small claims/disputes vs. going to prison or having child custody taken away

"you are more likely to be right with five judges over one"



Concerns and Considerations Around AI in Judicial Work

Reliability is currently insufficient for legal information.

- A “*non-starter*”

Use of language is precise and critical in the work of judges.

- *“so much of our job is reading and trying to understand what is meant by somebody else’s words and then expressing it in our words.”*

Privacy is a concern but not specific to AI.

- E.g. web search has many of the same privacy issues

AI may develop misconceptions from uninformed user behavior.

- *“They might be totally satisfied with the answers, but they may be completely wrong. And [the model] is potentially drawing false inferences from the conversations that it’s having with other people.”*

AI bias needs to be understood.

- Does it mitigate human bias or introduce bias?

AI could lead to de-skilling.

- *“rely on AI’s output without yourself ever going or properly going to the source documents”*

The judges asked for this experiment



“Suppose ... half the judges are given assistance by AI ...”

— one judge, proposing the experiment we are planning

-> A call for randomized evaluation

What legal reasoning actually is

Legal reasoning recruits TWO brain systems. (Martínez et al)

LOGICAL

Rules, deduction.

MORAL & SOCIAL

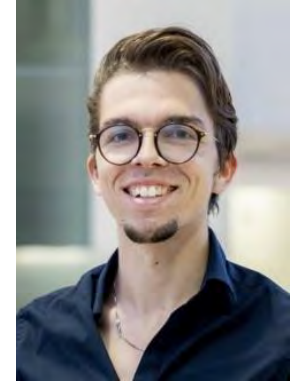
Intentions, values, fairness



MULTIPLE DEMAND
NETWORK



THEORY OF MIND
NETWORK



Where this is headed

Modeling Expert Cognition (fNIRS)

Can we detect different cognitive processes in real time, in the real world? fNIRS with experienced lawyers, reasoning with and without AI. Moving from fMRI to fNIRS which can be used in more real-world settings.

Compare AI vs Human Reasoning

Run today's tools through the same tasks; find the gaps.

Design Systems That Build Expertise

Adaptive support that helps people develop expertise.

This isn't only about law.

As AI absorbs cognitive labor, how does any profession keep building expertise that only forms by doing the hard work yourself?

Medicine sits right beside law.

What is the equivalent in your work?

AI can cultivate expertise, but only if we understand the human side first.

A really good teammate

- Adapts as they get to know you.
- Knows when you need help.
- Knows when not to interrupt.

Helps you get better at what you do.

Designing AI that works with people

1 Learn how the work is done today, without AI.

So we're not taking away really important parts of the process.

2 One size doesn't fit all.

How people see AI in their work depends on their role and their everyday work.

3 Keep people engaged.

Not bored and zoned out, not so overloaded they're making errors.

4 Look out for newer people.

They are still developing their judgment and reasoning skills.

***Technology should be shaped to fit people —
not the other way around.***

Neuro + Law +

HUMAN-COMPUTER
INTERACTION

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