Transparency of ATC Automation: How Can Personalized Decision Support Improve Human-Automation Interaction?

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Human Factors in Control (HFC) Spring Meeting - April 17-18, 2018 - Halden, Norway

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- ONE SIZE **DOES NOT** FIT ALL -

INTRODUCTION

1930s   1950s

1980s   2017

1930s

1950s

1980s

2017

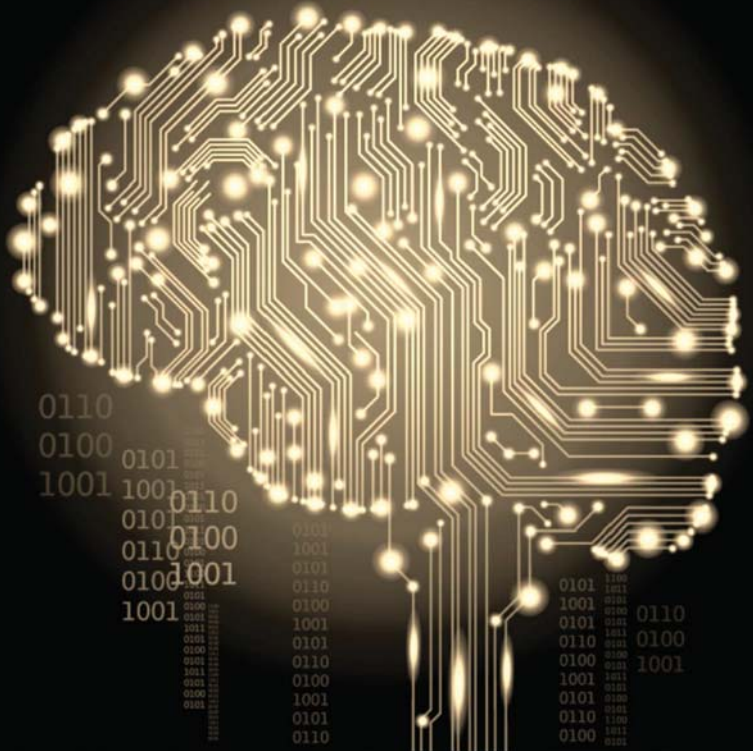

Mismatch in problem solving
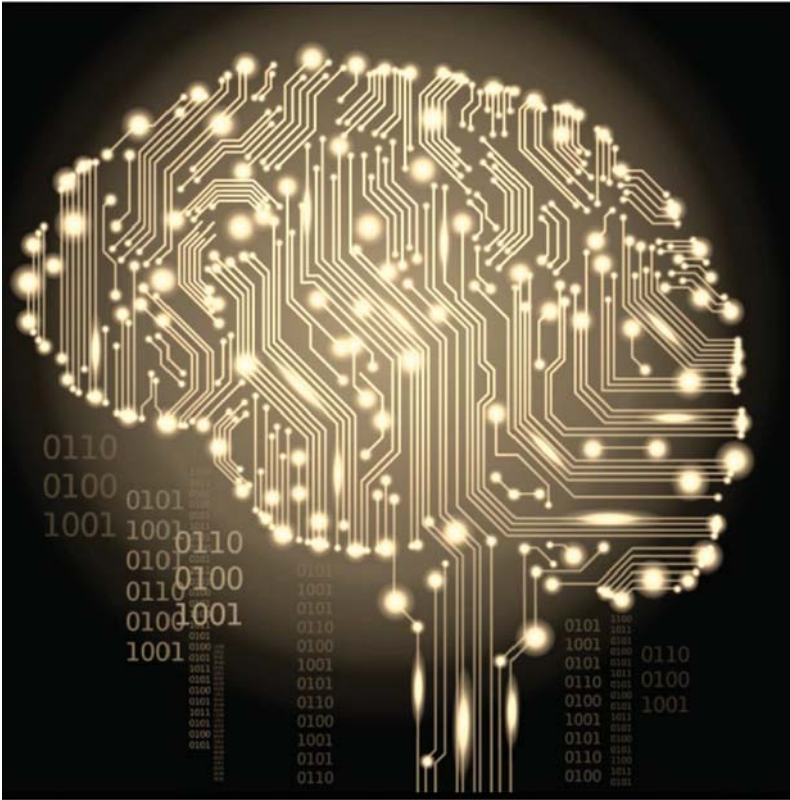
As automation
becomes 'smarter'...

HUMAN
UNDERSTANDING
OF AUTOMATION

AUTOMATION
INTELLIGENCE
& COMPLEXITY
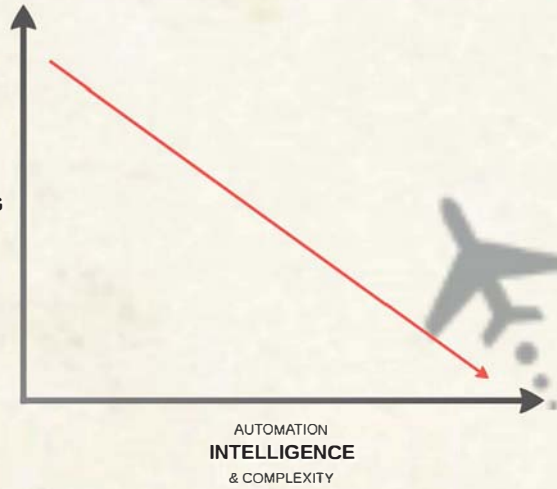
...it becomes more
difficult to understand.

How can we

improve the understanding
of

automation behavior?

0110
0100 0101
1001 1001
010 0110
0110 0100
0100 1001
1001

0101
1001
0110
1001
0101
0110
0100

0101 0110
1001 0100
0100 1001
1001
0101
0110
0100

Automation transparency

the
automation's ability
to afford
understanding & predictions
about its
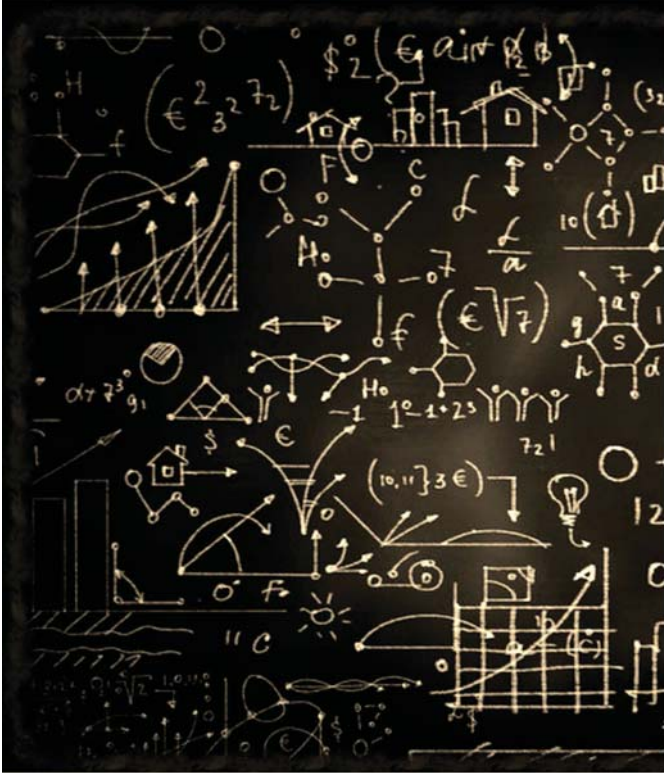behavior

...towards an
individually-centered approach?

- ONE SIZE **DOES NOT** FIT ALL -

From a
technology-driven approach...
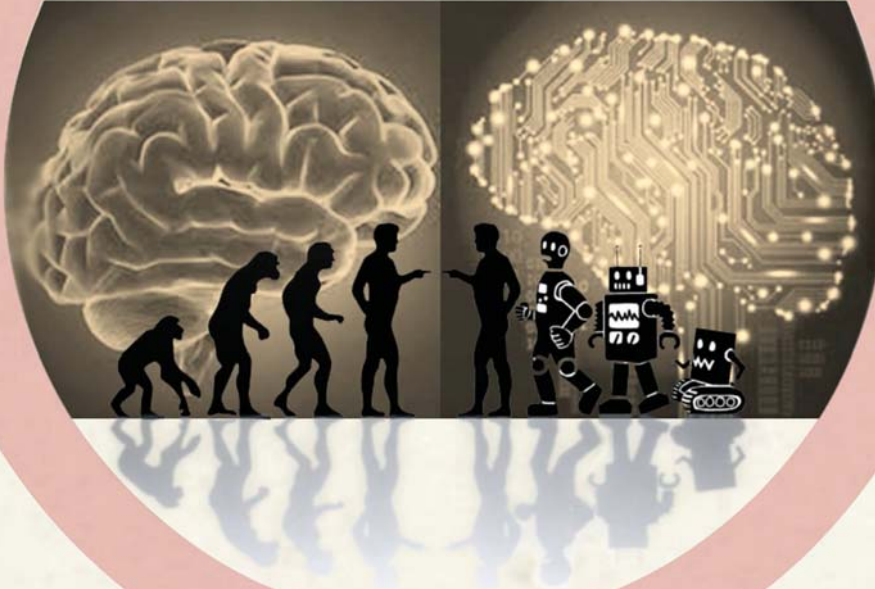
Is **individually-centered** decision support relevant in **complex** and **safety-critical work?**

RESEARCH QUESTION

How does a decision aid's *strategic conformance* affect controller task performance and use of that aid?

STRATEGIC CONFORMANCE

"the degree to which the **automation's solution** *and* **apparent underlying operations match** *those of the* **human's"**
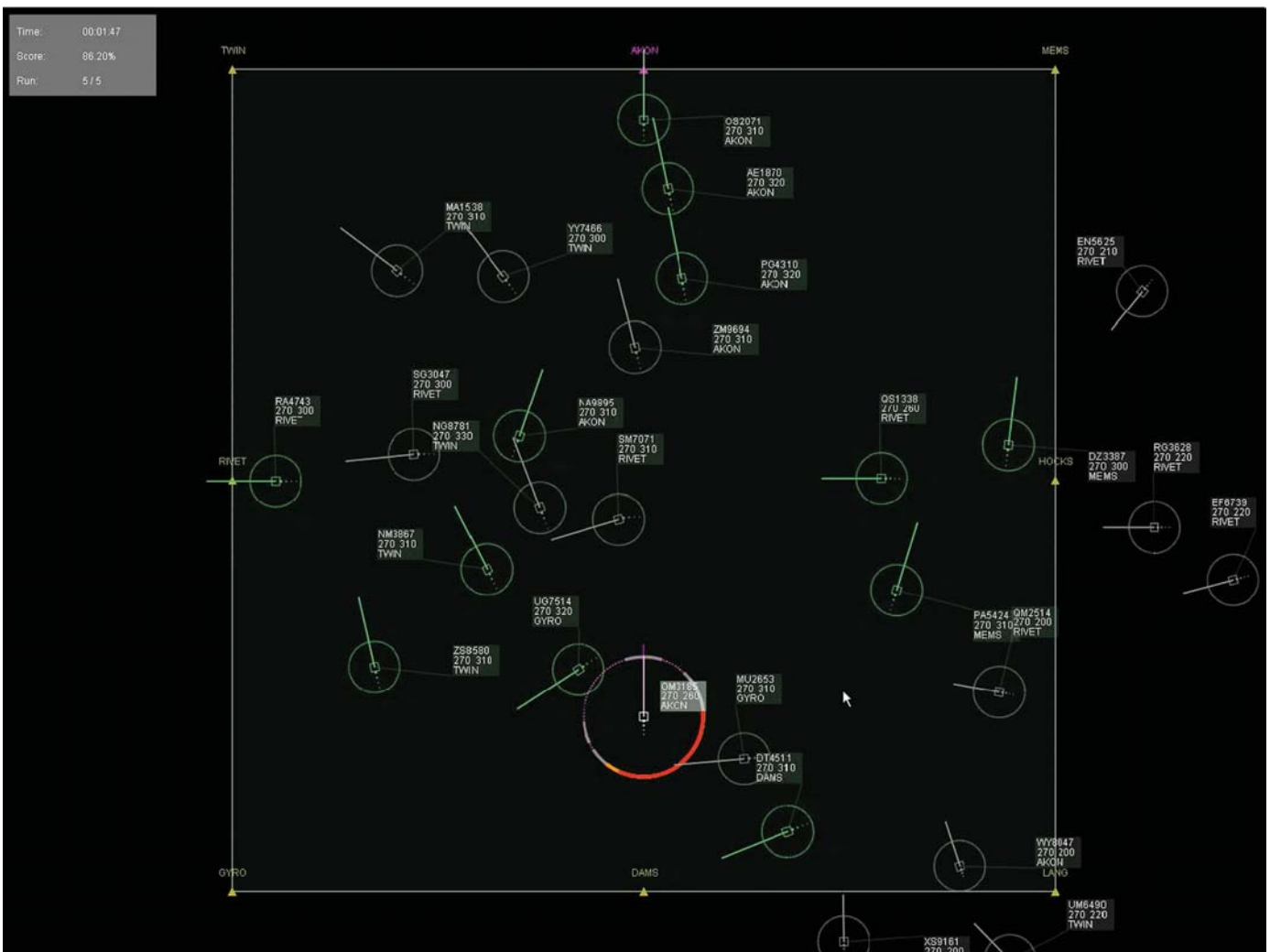

APPROACH

1

Prequel simulation
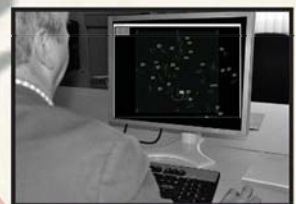
2

[Conformance design
Analyze solutions]

3

Experiment

50% conformal
(replay of controller's own solution)

50% nonconformal
(replay of colleague's solution that is different)

Experiment

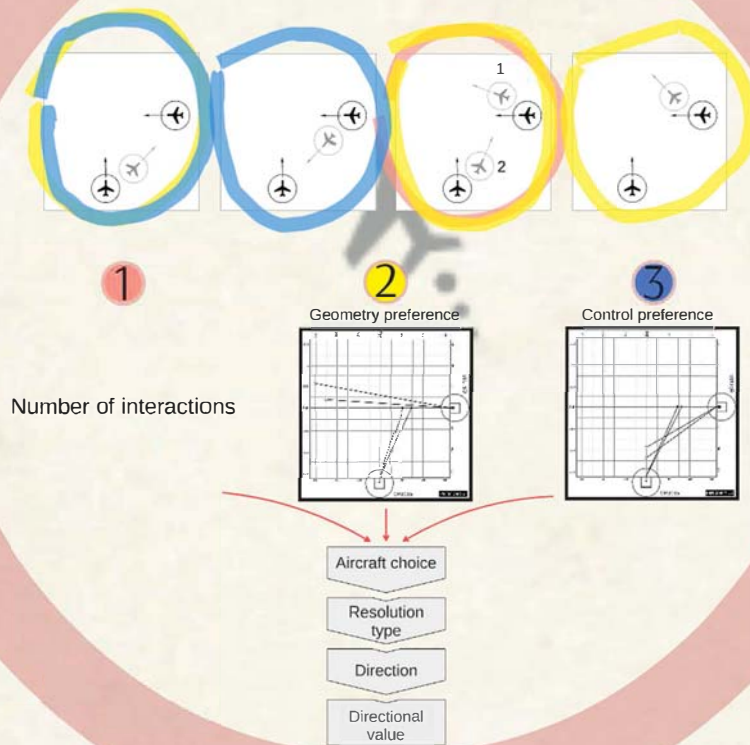**50% conformal**
(replay of controller's own solution)

50% nonconformal
(replay of colleague's solution that is different)

CONSISTENCY PATTERNS

| 1 | 2 | 3 |

Number of interactions

Geometry preference

Control preference

Aircraft choice

Resolution type

Direction

Directional value

EFFECTS OF
STRATEGIC CONFORMANCE
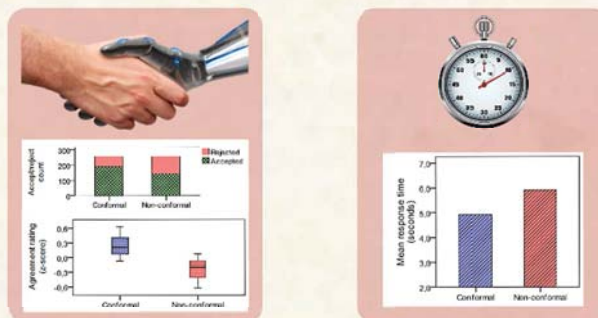
Conformal advisories had significantly higher
acceptance, higher agreement, and faster response
time than non-conformal advisories

DO WE WANT PERSONALIZATION?

SELF-EXPLAINING AUTOMATION

FUTURE RESEARCH

Multiple Remote Towers   Maritime piloting

R E S K I L L

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