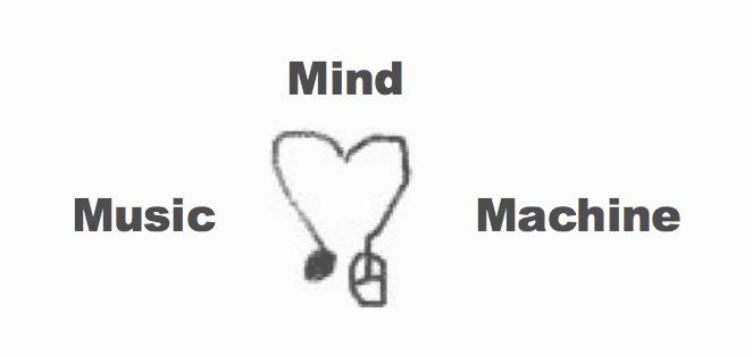
Two or Three Things You Need to Know About AI Design: From Human Factors Perspective



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MIND MUSIC MACHINE LAB

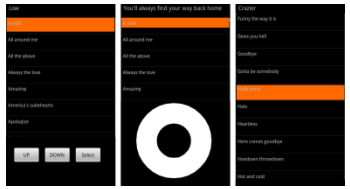
VIRGINIA TECH

My Research Areas

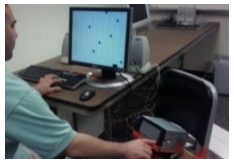
AFFECTIVE COMPUTING

ASSISTIVE TECHNOLOGY

AUDITORY DISPLAYS



AUTOMOTIVE UI



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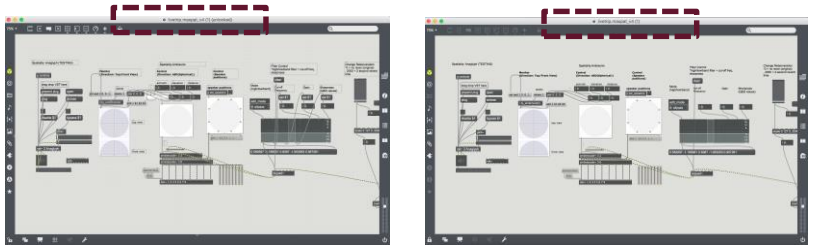
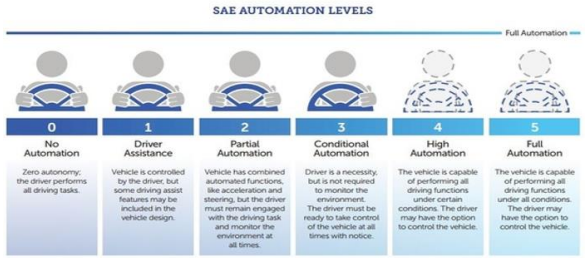
1. AI systems that pose problems to the users (1)

- **Mode Confusion**



Unlocked vs. Locked



Automated Vehicles

Only two modes:
- When unlocked, no play: but still confusing

Consequences:
- **No serious problem**.
- Just lock and play again

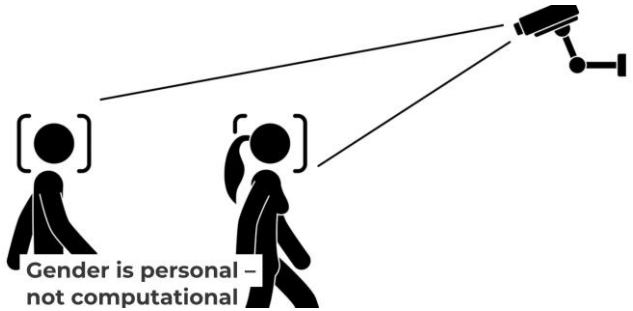
Six modes:
- In four modes, partial collaboration **(dynamic function allocation)**

Consequences:
- Fatal outcomes on road safety and lives

Research Agenda:
- **How to let drivers be aware of the level they're in**
- **How to train them what they're supposed to do in that mode**
- **Or how to reduce the number of modes itself**

1. AI systems that pose problems to the users (2)

- **Bias & Discrimination**



Automatic Gender Recognition

Only two modes:
- Male vs. Female

Consequences:
- Gender reductionism
- AGR Threatens safety of the transgender community and beyond

Research Agenda:
- **Is it necessity?**
- **AGR as a tool for oppression: It's just going to exacerbate what's already there**
- **Inform users if and how they might be gendered and let them opt out**
- **Let users define their own gender/age identity**

* Hamidi, F., Scheuerman, M. K., & Branham, S. M. (2018, April). Gender recognition or gender reductionism? The social implications of embedded gender recognition systems. In *Proceedings of the 2018 chi conference on human factors in computing systems* (pp. 1-13).

2. Design, development, and user testing methods and practices currently adopted in AI (1)

- **Optimization as product**

Facial Affect Detection

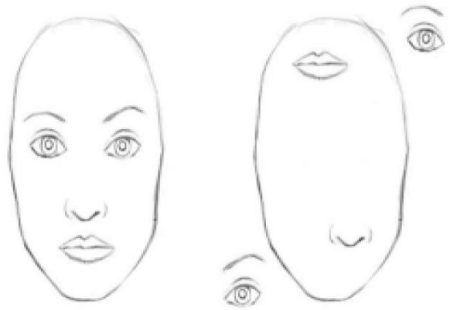


Fig. 9. To a CNN, both pictures are similar, since they both contain similar elements. [29]

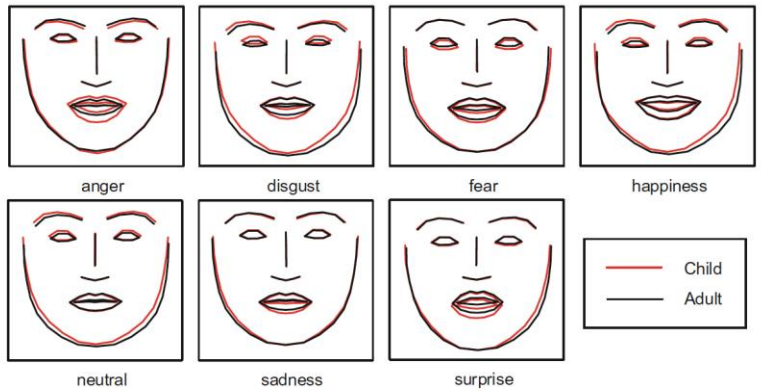


Fig. 2. Average faces of children and adults when making different facial expressions

Practices:
- Use a lot of data points (e.g., 35,000 of face images in FER2013)
- Split the datasets as training data (80%) vs. validation data (20%)
- Use different methods (algorithms) & different datasets
- Use dropouts to avoid overfitting
- Little research done with actual users

Consequences:
- High accuracy but overfitting
- Accuracy drops with validation data and drops even more with real users

Research Agenda:
- **Comparison between algorithms**
- **Use target-appropriate database**
- **Context-dependent user study**
- **Limitations (can't fully estimate emotions based on facial expressions)**
- **Ethical issues**

* Zheng, Z., Li, X., Barnes, J., Park, C. H., & Jeon, M. (2019, July). Facial Expression Recognition for Children: Can Existing Methods Tuned for Adults Be Adopted for Children?. In *International Conference on Human-Computer Interaction*(pp. 201-211). Springer, Cham.

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2. Design, development, and user testing methods and practices currently adopted in AI (2)

- **Divergence as process**

Dancer sonification

Practices:
- Use small data points (even with one dancer)
- Quickly prototype different alternatives
- Use AI as a tool for design research & creativity
- Research done always with users (or expert)

Consequences:
- Low accuracy but more opportunities
- Impossible to generalize

Research Agenda:
- **How many participants?**
- **How many data points?**
- **If accuracy is not our ultimate goal, how to evaluate our system?**

* Landry, S., & Jeon, M. (2020 March). Interactive sonification strategies for the motion and emotion of dance performances. Journal on Multimodal User Interfaces, 14:167-186.

Thank You! Questions?