

ADDRESSING THE COMMUNICATION RATE GAP FOR AAC USERS VIA IMPROVED TEXT INPUT



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Motivation

- Augmentative and Alternative Communication (AAC) systems assist individuals with communication difficulties.
- AAC systems have slower communication rates than typical conversational rates
- Accurate and low-delay text predictions are crucial for improving the effectiveness of AAC devices
- The combination of AAC devices, prediction technologies, and Human Computer Interaction (HCI) modelling enhance AAC system design
- Improved AAC technologies can enhance the overall quality of life and social integration for AAC users

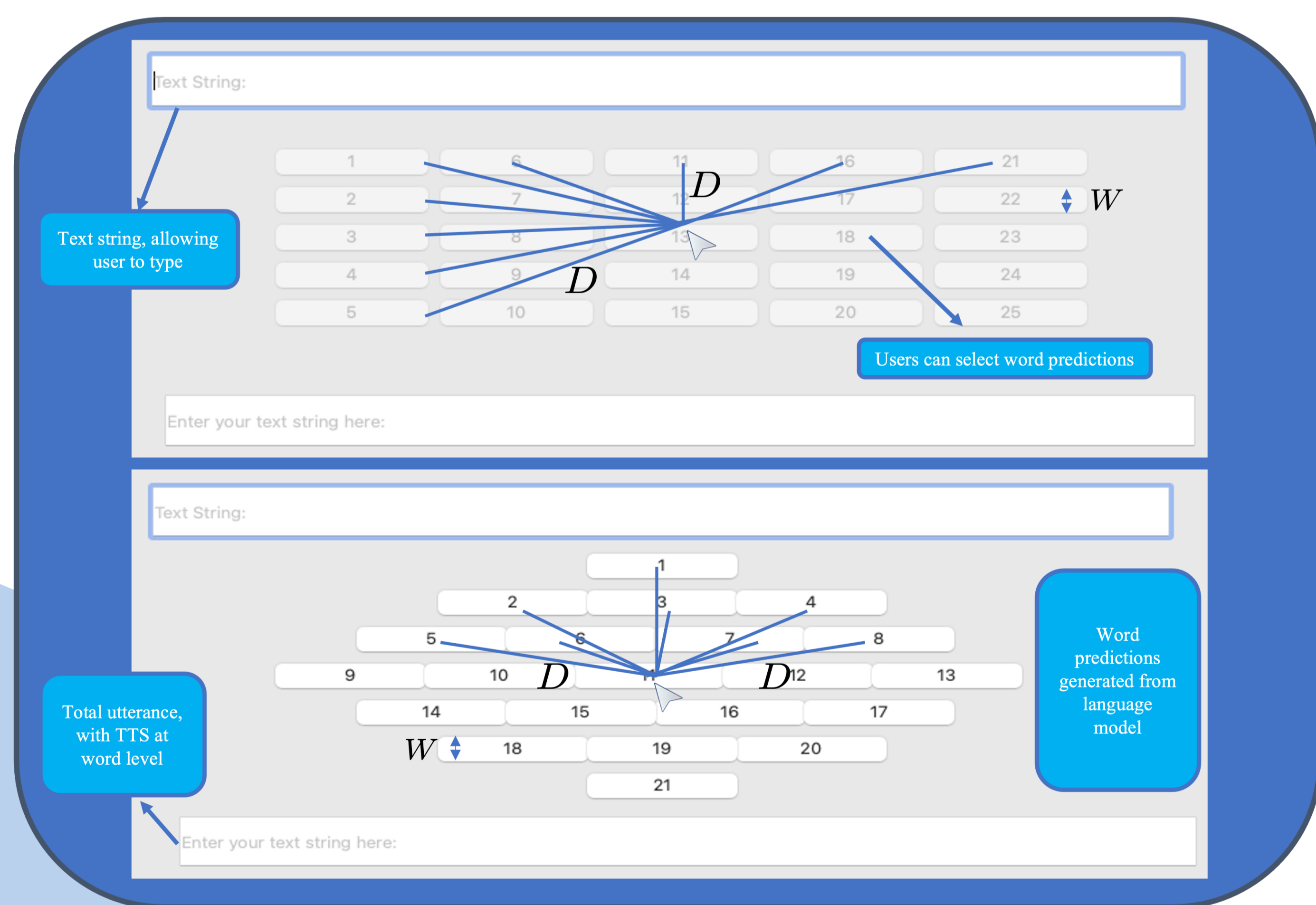
Fitts Law Modelling

- Fitts Law - HCI model aiding in User Interface design for efficient user movements
- Fitts' Law states that the time (MT) required to rapidly move to a target area (W) is influenced by the distance (D) to the target and the size of the target

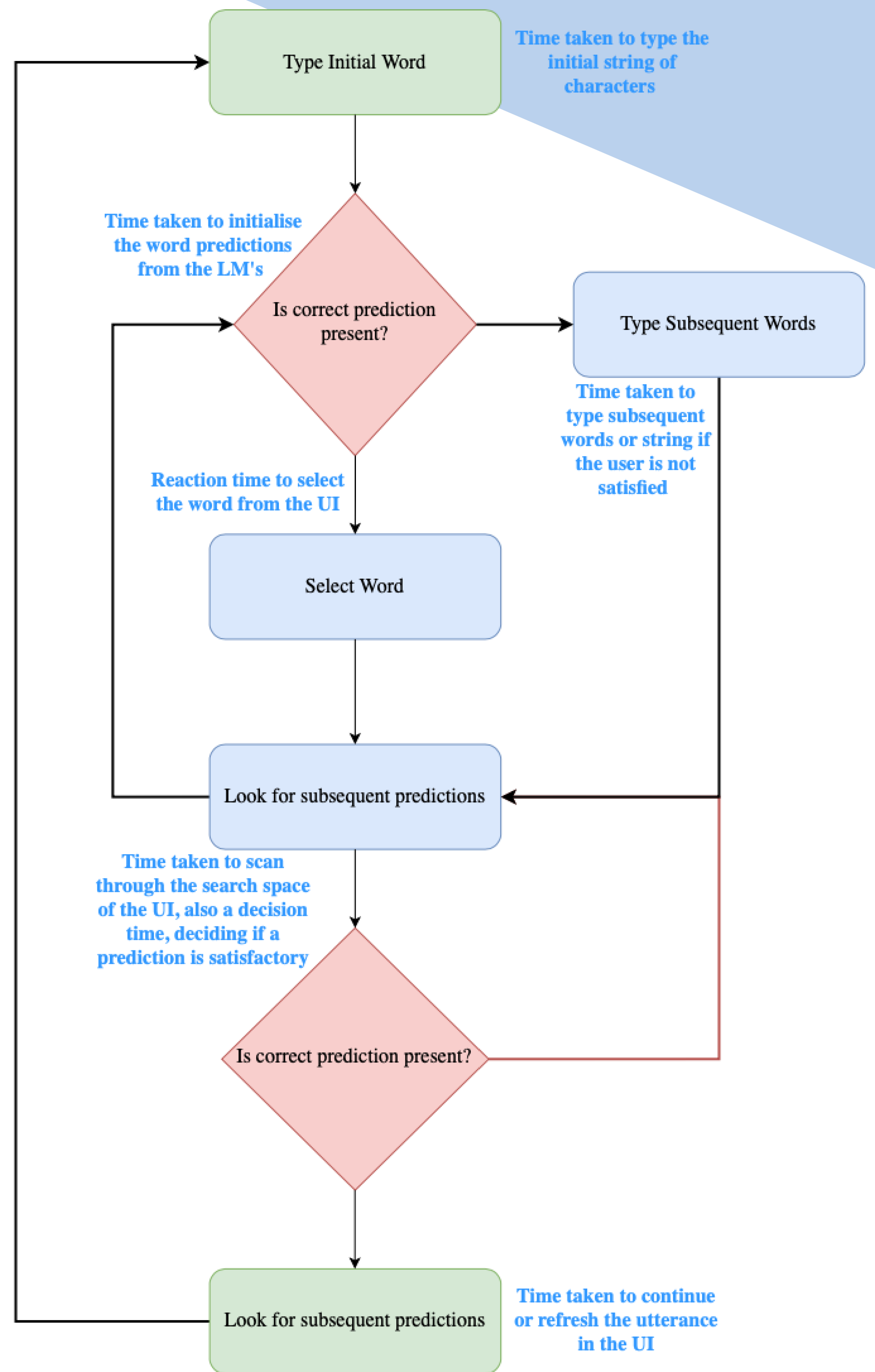
$$ID = \log_2 \left(\frac{2D}{W} \right) \quad (1)$$

The Index of Difficulty (ID), is directly related to a prediction of a movement time, by:
Fitts Law

$$MT = a_f + b_f(ID) \equiv a + b \cdot \log_2 \left(\frac{2D}{W} \right) \quad (2)$$



Text-Input with Prediction Language Model



Results

Table 1: Comparisons of text entry rates with varying text input methods

Text Entry Method	Words Per Minute (WPM) Rates
QWERTY Physical Keyboard	51.56 ± 20.2 [1]
QWERTY Touchscreen Keyboard	45 [3]
Gesture Keyboards (Swype)	45 [2]
Dasher	17.26 (Upper Bound) [4]
RoBERTa AAC - Radial UI	25.75
RoBERTa Daily Dialog - Radial UI	23.33

References

- [1] V. Dhakal, A. M. Feit, P. O. Kristensson, and A. Oulasvirta. Observations on typing from 136 million keystrokes. In *Conference on Human Factors in Computing Systems - Proceedings*, volume 2018-April. Association for Computing Machinery, 4 2018.
- [2] P. O. Kristensson. *Discrete and continuous shape writing for text entry and control*. PhD thesis, Institutionen för datavetenskap, 2007.
- [3] P. O. Kristensson, S. Brewster, J. Clawson, M. Dunlop, L. Findlater, P. Isokoski, B. Martin, A. Oulasvirta, K. Vertanen, and A. Waller. Grand challenges in text entry. In *CHI'13 Extended Abstracts on Human Factors in Computing Systems*, pages 3315–3318. 2013.
- [4] D. J. Ward, A. F. Blackwell, and D. J. C. MacKay. Dasher—a data entry interface using continuous gestures and language models. In *Proceedings of the 13th annual ACM symposium on User interface software and technology*, pages 129–137, 2000.

Conclusions

- Radial interface is predicted via Fitts Law to have higher efficiency for the user
- Decreased movement times for the radial UI, in comparison to a grid or list layout, resulting in higher communication rates
- Fine-tuned RoBERTa, outperforms BERT language models