



STQ Workshop

Can Gender Analysis Improve Quality?

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21/11/2022



Quality of Emerging Services for Speech and Audio: A user-centred perspective

Can Gender Analysis Improve Quality?

Agenda:

- Background summary / research reasons.
- Completed experiments and results.
- Anticipated future research.
- Conclusions.

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- Speech quality assessment established by existing standards.
- Subjective (human) and objective (machine) testing.
- Intrusive and non-intrusive methodology.
- Human factors not traditionally considered.
- Necessity to evaluate the impact of different social factors.
- Revision of existing algorithms to account for those differences.

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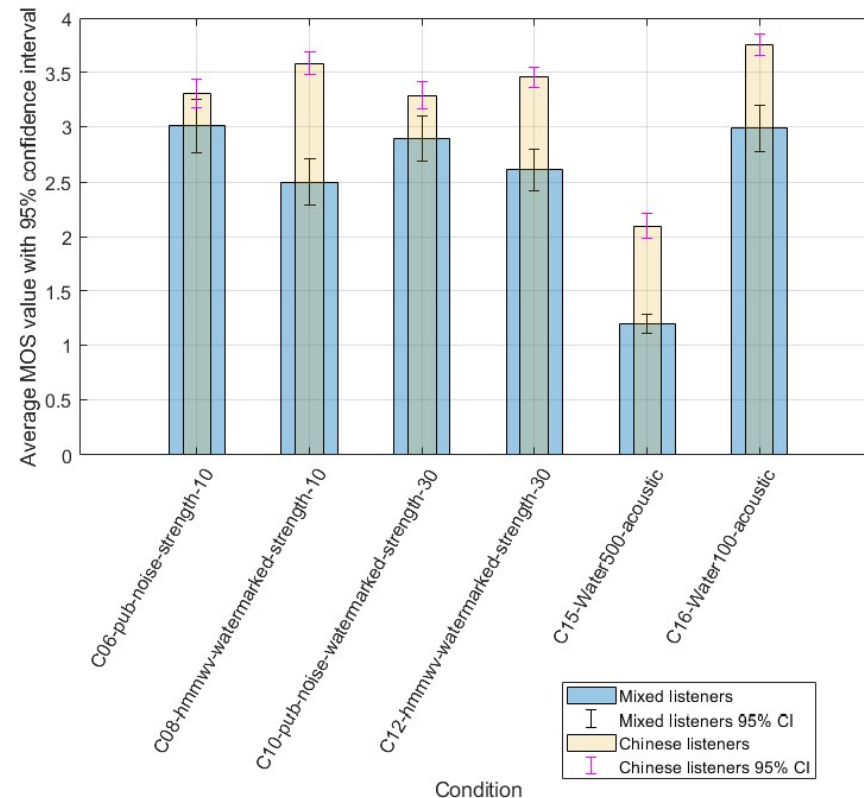
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- Traditional subjective testing: intrusive or non-intrusive, laboratory.
- Intrusive methodology is suited for specific analysis purposes.
- Non-intrusive method meets in-field requirements standards.
- Objective testing include both methods in various flavours.
- Obvious cost reduction and practical usage of objective estimators.
- Traditionally, algorithms present significantly worse results.

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- Human factors implication on mobile radio transmissions.
- Initial experiment involves geographical origin.
- Significant bias from Chinese listeners compared to European ones.



Y. Kowalczyk and J. Holub, "Evaluation of digital watermarking on subjective speech quality," *Scientific Reports*, vol. 11, no. 1, p. 20185, Oct 2021. [Online]. Available: <https://doi.org/10.1038/s41598-021-99811-x>

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- Further research on Digital vs Analog transmissions.
- Results reveal strong gender difference and discrimination.
- Analog technology and feminine voices are perceived as having a worse quality.

Y. Kowalczyk and J. Holub, "Can digitization of professional mobile services advance gender equality?", Under Review – Speech Communication Journal, 05-2022.

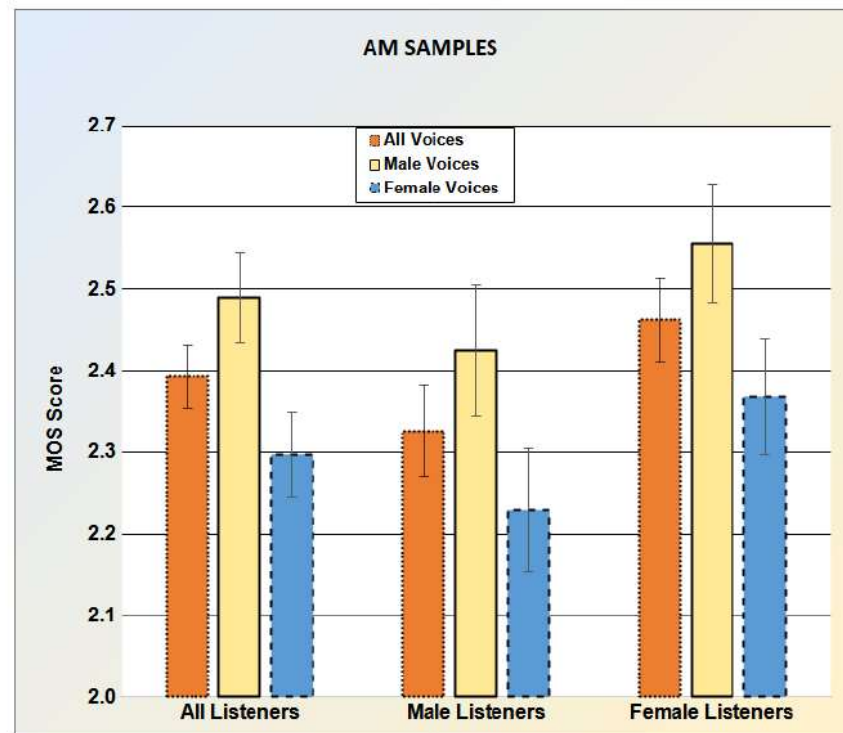


Figure 4.2: Results of AM samples with varying speakers' and listeners' gender including 95% confidence interval.

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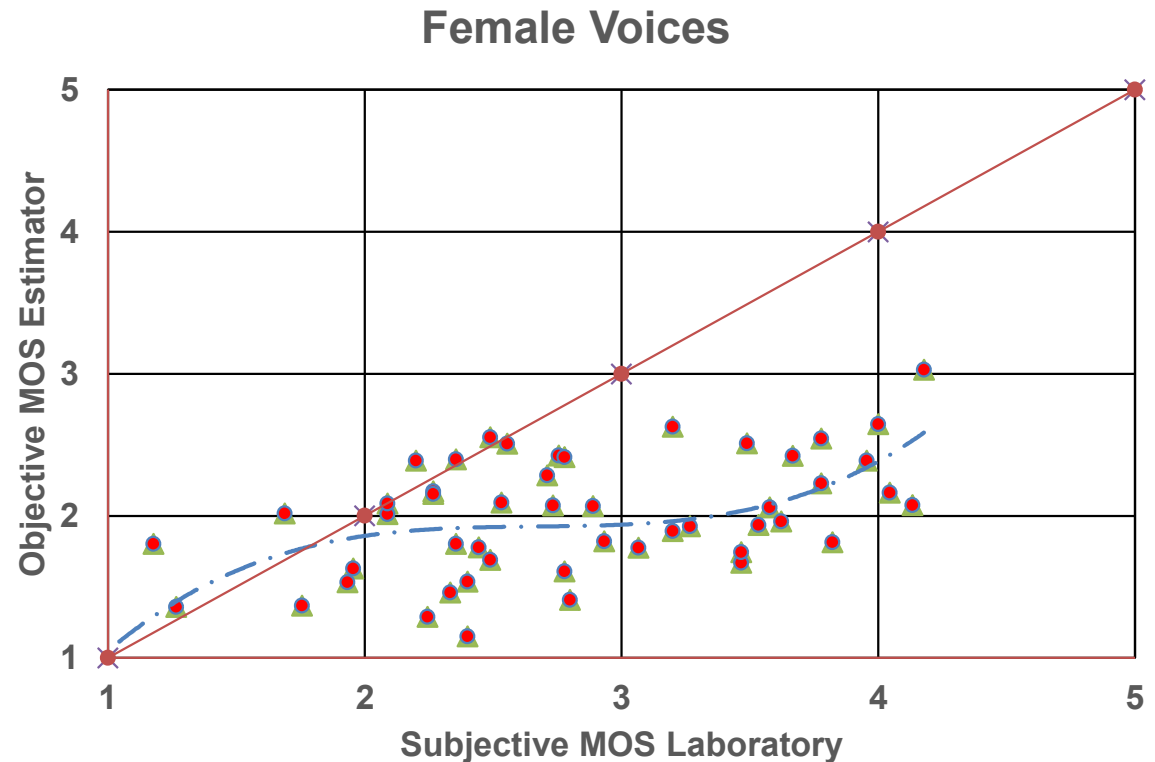
- Extension of previous research – objective estimators and female voices challenged.
- Results confirm lack of reliability given by modern estimators (including latest open-source algorithms).
- Previous observation of gender quality impact is repeated.

Y. Kowalczyk and J. Holub, "Reliability of speech quality estimators with objective gender differences", Under Review – IEEE Transactions on Audio, Speech, and Language Processing, 10-2022.

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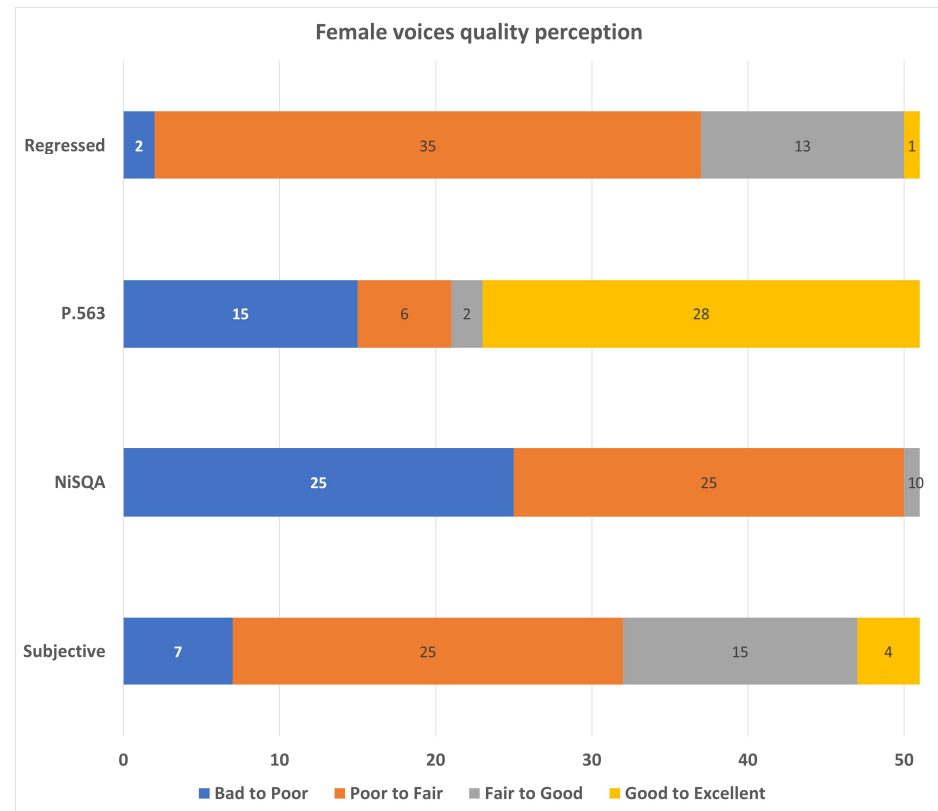
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- Difference between estimators over a given dataset.
- No significant improvements of prediction with isolated gender voice.
- Scores remain widely spread in quality values compared to subjective testing.



Y. Kowalczyk and J. Holub, "Reliability of speech quality estimators with objective gender differences", Under Review – IEEE Transactions on Audio, Speech, and Language Processing, 10-2022.

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- Additional research to provide conclusions on human factors in speech quality estimation.
- Air-band digital coder and observed differences with analog experiment.
- Investigation on the origins of the gender voice discrimination: technical, social, perceptual?
- Integration of a corrective action in existing technologies.
- Consideration of the difference that might have a significant social impact between genders.

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Questions?