



Using convolutional neural networks to predict the audibility of acoustic warning signals

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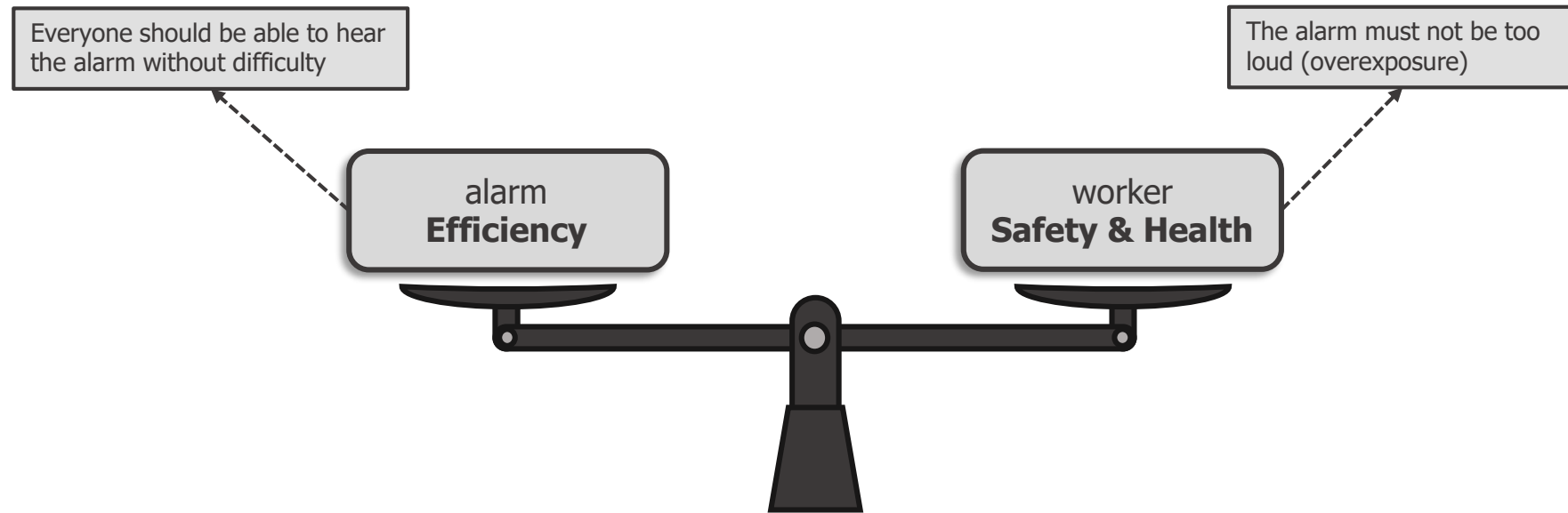
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 Notre métier,
rendre le vôtre plus sûr

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Background

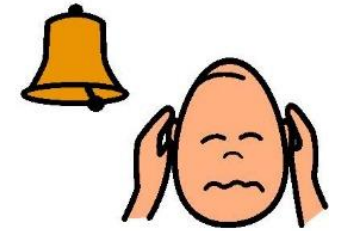
❓ *How loud should my alarm sound?*



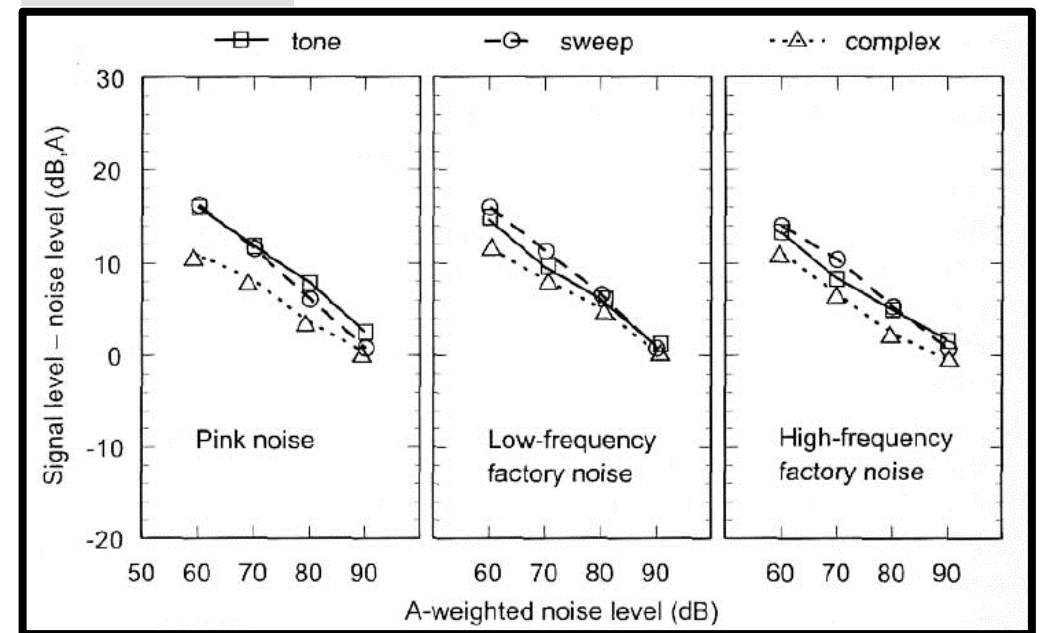
The ISO 7731 Standard

Danger signals for public and work areas

- Requirements [1]
 - “The danger signal shall be **clearly audible**”
 - Audibility criterion : $SNR > 15$ dB
- Limitations
 - No acoustical definition of “clearly audible”
 - In contradiction with experimental results
 - May lead to excessive alarm sound levels



(Žera, 2004) [2]



[1] ISO 7731:2003

[2] Žera & Nagórski, JOSE, 2004

Solutions

- Psychoacoustical tests
 - Require heavy procedures : multiple participants, repeated measurement design ...
 - Are time-consuming
 - Should be repeated for any new alarm or background

What we propose

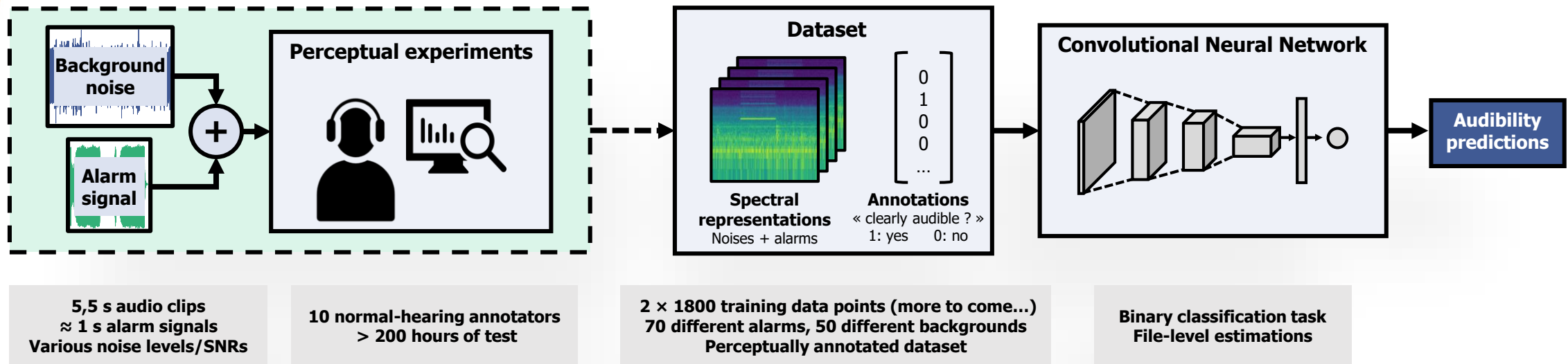
- Neural network models
 - Data-driven approach
 - Can be applied to new signals
 - Faster and more convenient than perceptual experiments

[3] Glasberg & Moore, JAES, 2005

[4] Zheng, JOEH, 2007

Convolutional neural network-based approach

Method





Thank you for your attention



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YouTube



References

- [1] I. O. for standardization (ISO), *Ergonomics—danger signals for public and work areas — auditory danger signals*, 2008.
- [2] J. Žera and A. Nagórski, Preferred levels of auditory danger signals, *Int. J. Occup. Saf. Ergon.*, vol. 6:sup1, 2004.
- [3] B. R. Glasberg and B. C. J. Moore, Development and Evaluation of a Model for Predicting the Audibility of Time-Varying Sounds in the Presence of Background Sounds, *J. Audio Eng. Soc*, vol. 53, no. 10, 2005.
- [4] Y. Zheng, C. Giguère, C. Laroche, C. Sabourin, A. Gagné, and M. Elyea, A Psychoacoustical Model for Specifying the Level and Spectrum of Acoustic Warning Signals in the Workplace, *Int. J. Occup. Environ. Hyg.*, vol. 4, no. 2, 2007.