



HAL
open science

Wavelets for CGM Denoising

Nicolas Magdelaine, Lucy Chaillous, Isabelle Guilhem, Jean-Yves Poirier,
Michel Krempf, Fournier-Guilloux Anne-Laure, Claude H. Moog

► **To cite this version:**

Nicolas Magdelaine, Lucy Chaillous, Isabelle Guilhem, Jean-Yves Poirier, Michel Krempf, et al.. Wavelets for CGM Denoising. ATTD 2016; 9th International Conference on Advanced Technologies & Treatments of Diabetes, Feb 2016, Milano, Italy. hal-01264662

HAL Id: hal-01264662

<https://hal.science/hal-01264662v1>

Submitted on 28 Nov 2024

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution 4.0 International License



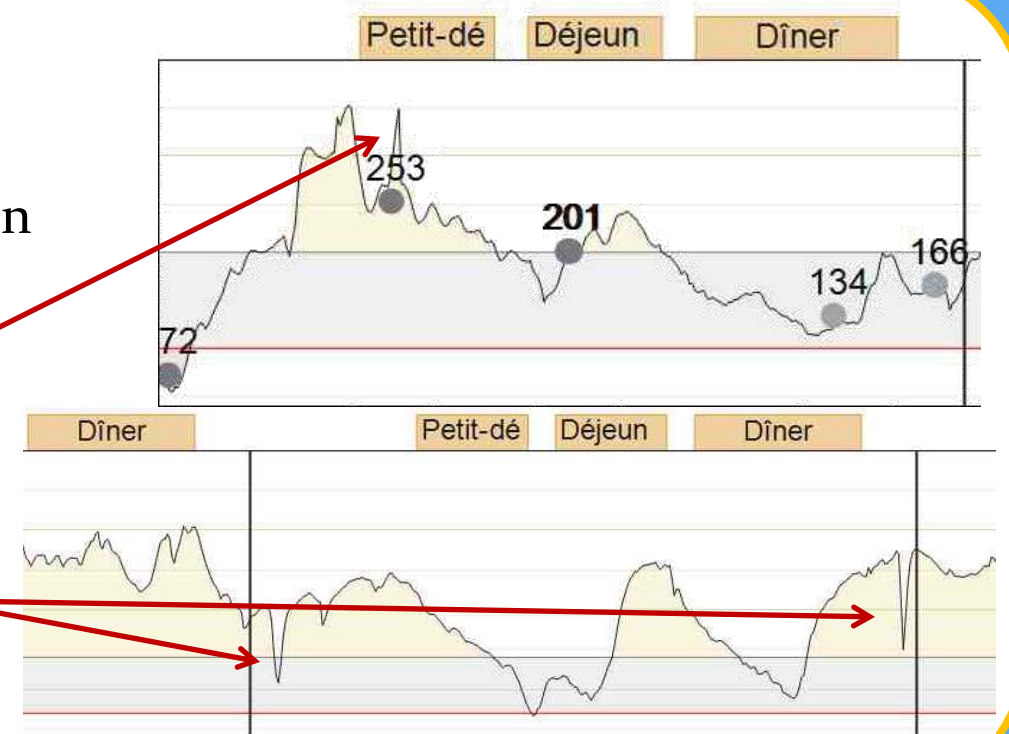
Background

Continuous Glucose Monitoring devices

- allow sensor augmented pump therapy for type-1 diabetic patients
- are useful for physicians to analyze nycthemeral glycemic profile and glucose variability.

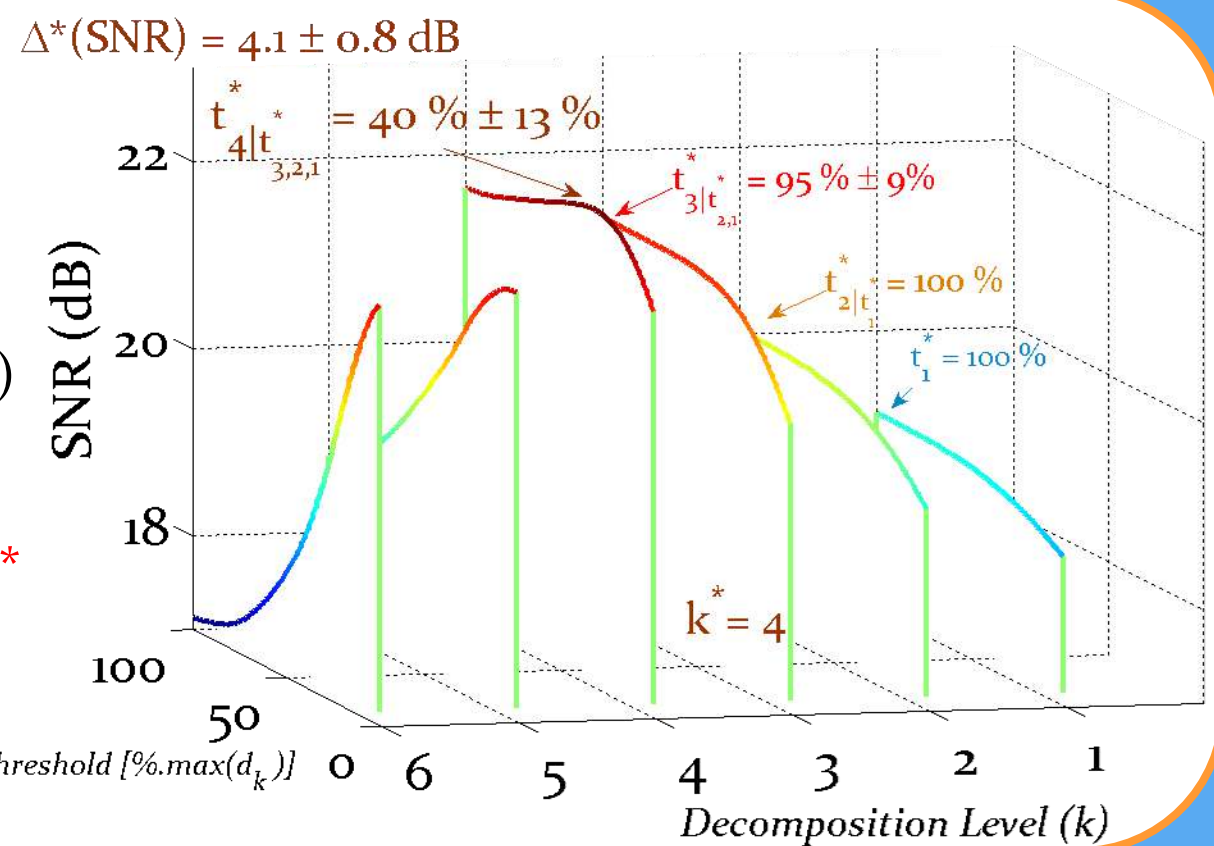
Common sources of error in CGM readings are:

- **Deviations**
- **Spikes**
- **Loss of sensitivity**



Methods

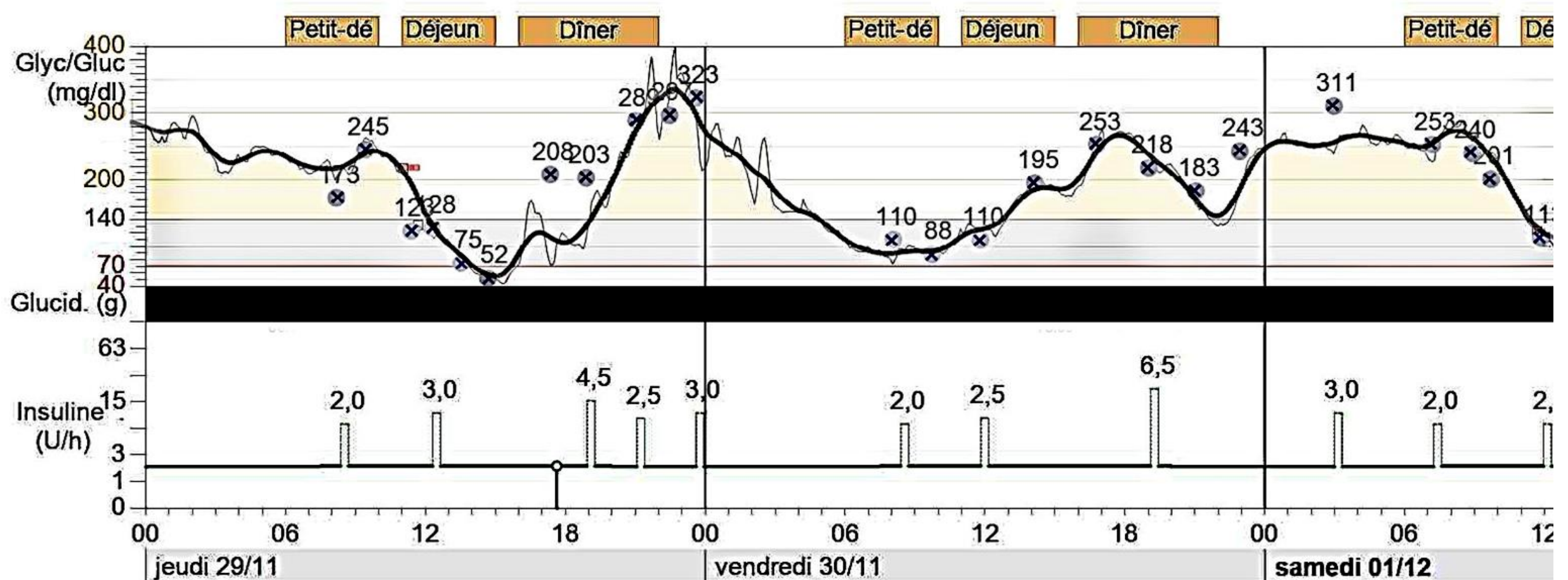
- Typical CGM noises have been used [1].
 - The noise was added to a simulated BG signal.
- The **objective is to maximize the Signal to Noise Ratio (SNR)**
- The Haar wavelet basis has been selected.
 - At each scale k of decomposition, the threshold level $t_k^* | t_{k-1}^*$ of the *detail coefficients* d_k is selected in order
 - Decomposition level k^* and thresholds t_k^* are computed.



Results

The optimal threshold levels t_k^* were used to denoise CGM data from 16 type-1 diabetic patients off-line.

- ✓ Deviations, loss of sensitivity and spikes were removed
- ✓ likely pikes and nadirs were not damped



Conclusion

- An off-line wavelet algorithm has been developed.
- It can provide a pre-processing tool for model fitting.
- It allows an accurate reading of CGM to facilitate analysis by the physicians.

References

[1] Facchinetti *et al.*, "Modeling the Glucose Sensor Error", IEEE TBME, 2014; 61(3): 620-629