Deep Learning methods for solid loading prediction from in-line Chord Length Distributions (CLDs)

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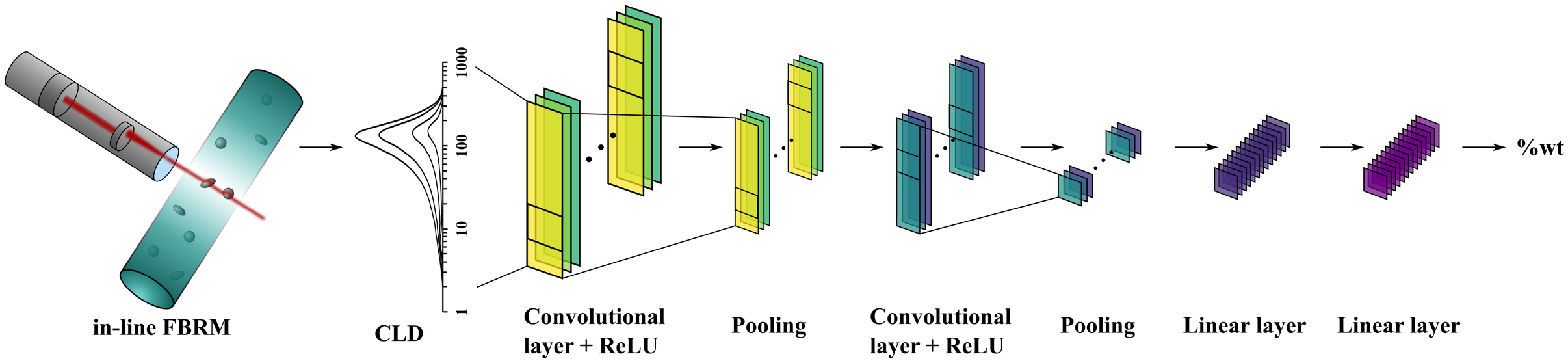
A **Deep Learning** model can predict the solid loading of a system from its CLD **more accurately** and in **real time.**

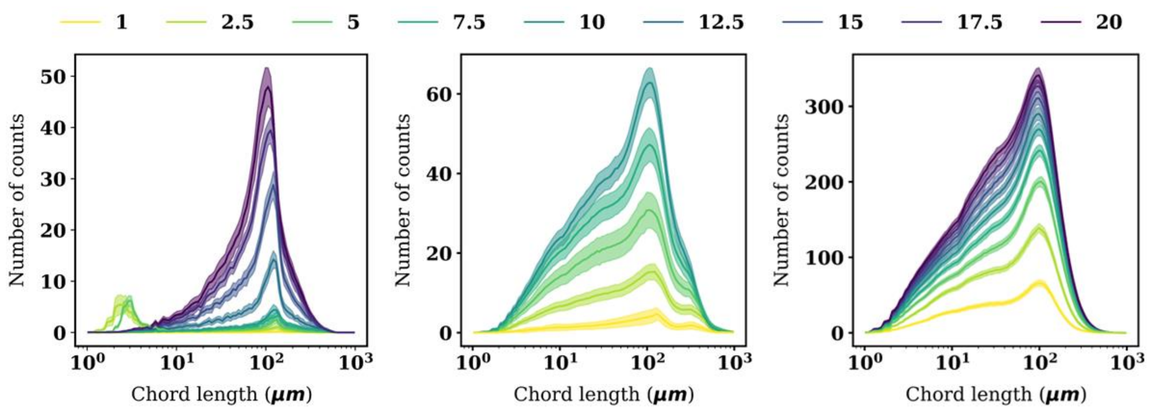


1. Motivation

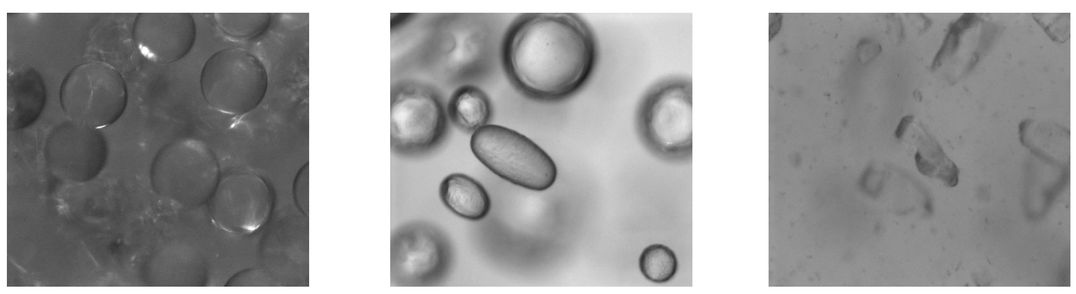
- The transition to **continuous manufacturing** in the pharmaceutical industry requires of real-time in-line feedback control.
- The implementation of **Process Analytical Technologies** needs of characterization techniques that offer accurate and timely results.

2. Evaluated datasets

Studied range: 200, 400 µm (S), 0-500 µm (E), 90-500 µm (L).



Spheres, 200 µm | Ellipsoids, 250-355 µm | Lactose, 90-125 µm

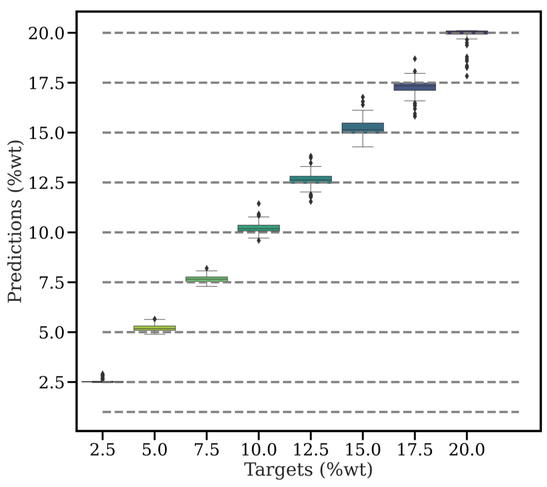


Example in-line (PVM) images of the datasets above.

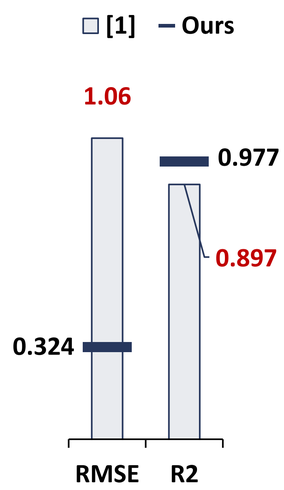
3. Results and discussion

Final metrics:

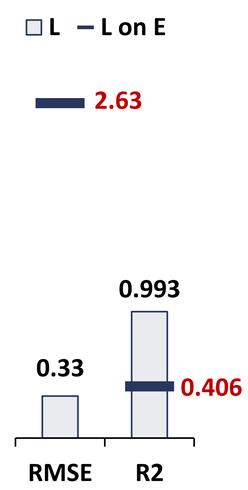
	RMSE (%wt)	R^2
- Spheres (S):	**0.247**	0.995
- Lactose (L):	**0.330**	0.993
- Ellipsoids (E):	**0.324**	0.977



Model outputs *vs* targets (L)



Comparison with [1] (E)



Transferability test (L model tested on E)

4. Conclusions

- This model is a **more accurate prediction method** for in-line FBRM solid loading measurements from CLDs than the PLS model in [1].
- The **transferability** of the model is low due to the heterogeneity of the datasets and needs improvement.

Reference: [1] Ferreira et al. DOI: 10.1016/J.POWTEC.2020.08.015

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