A statistical framework for joint pre-processing and deconvolution of solid-state NMR mixture spectra

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UHASSELT
KNOWLEDGE IN ACTION

janssen | PHARMACEUTICAL COMPANIES OF Johnson&Johnson

- Nuclear Magnetic Resonance (NMR) spectroscopy useful in studying various drug product properties, e.g. bioavailability

- Drug bioavailability strongly depends on the solid-state form (crystalline or amorphous) of active substance

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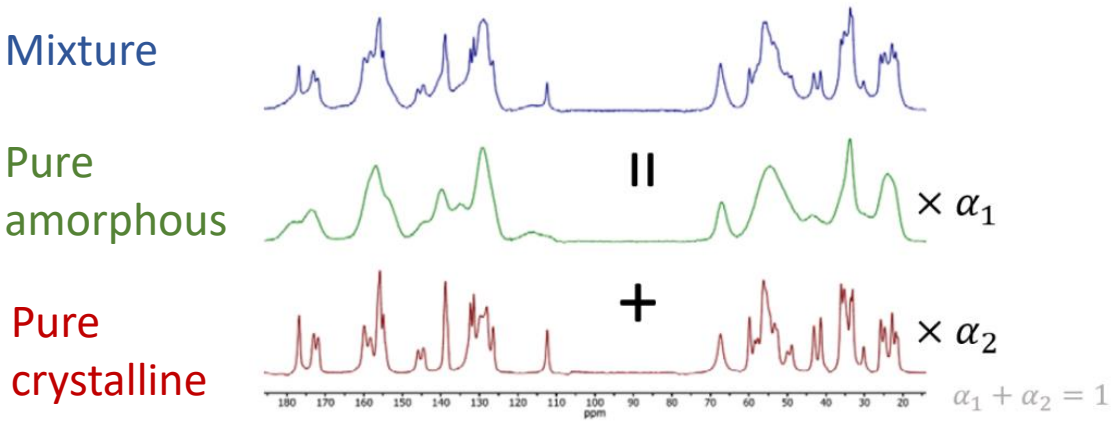
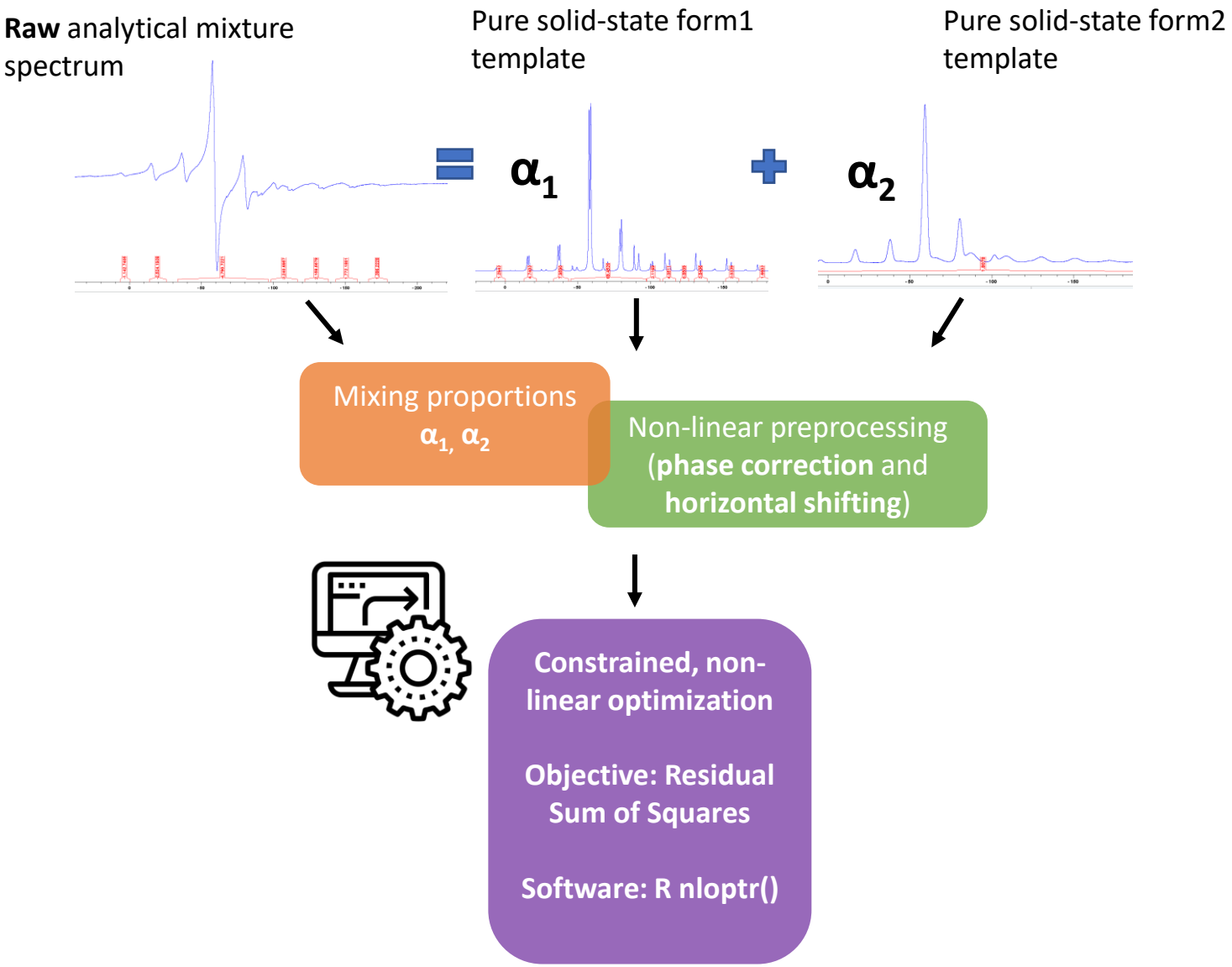
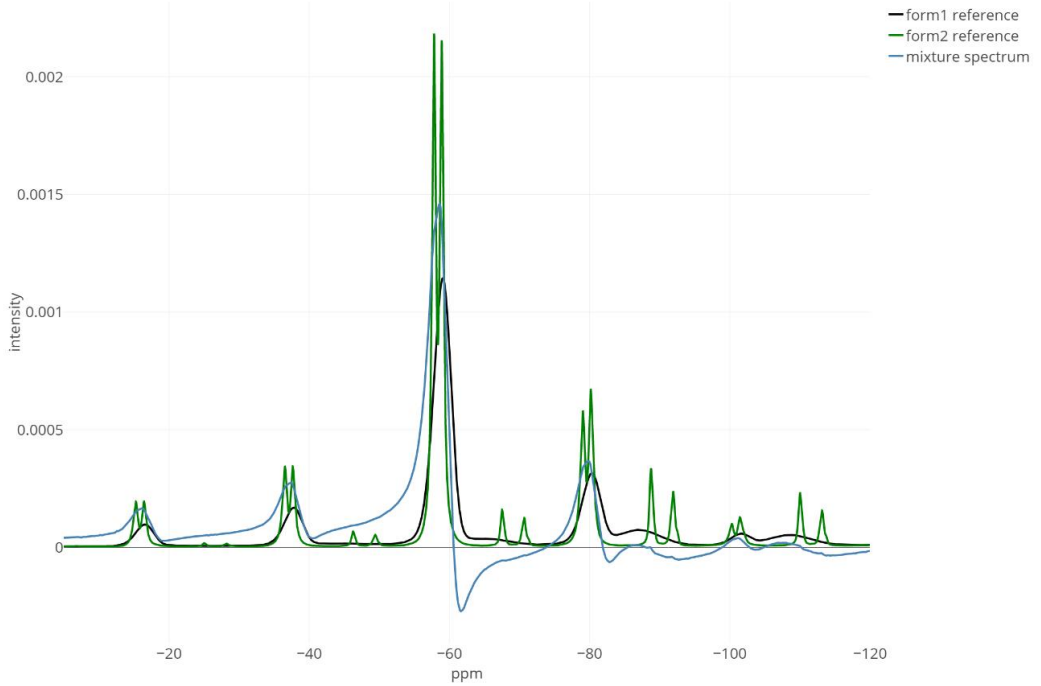


Goal: given ssNMR spectra of pure crystalline and amorphous reference samples, estimate $\boldsymbol{\alpha_1}$ and $\boldsymbol{\alpha_2}$ proportions in analytical, mixed samples


Raw analytical mixture spectrum
Pure solid-state form1 template
Pure solid-state form2 template
α_1
α_2
Mixing proportions α_1, α_2
Non-linear preprocessing (**phase correction** and **horizontal shifting**)
Constrained, non-linear optimization
Objective: Residual Sum of Squares
Software: R nloptr()

The method applied to 3% crystalline mixture and reference spectra …



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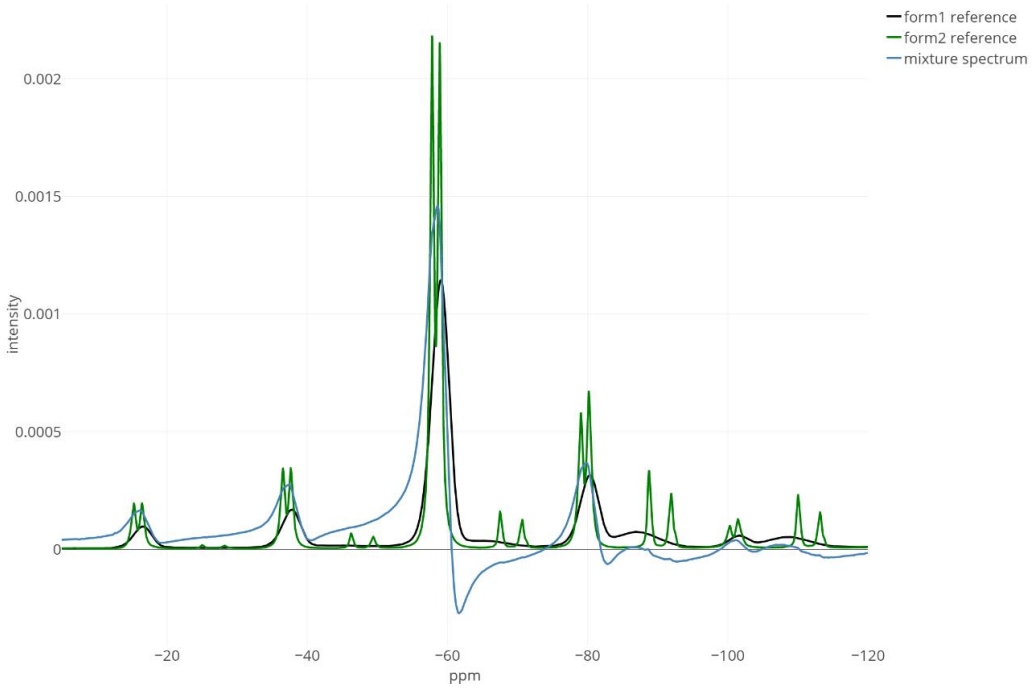
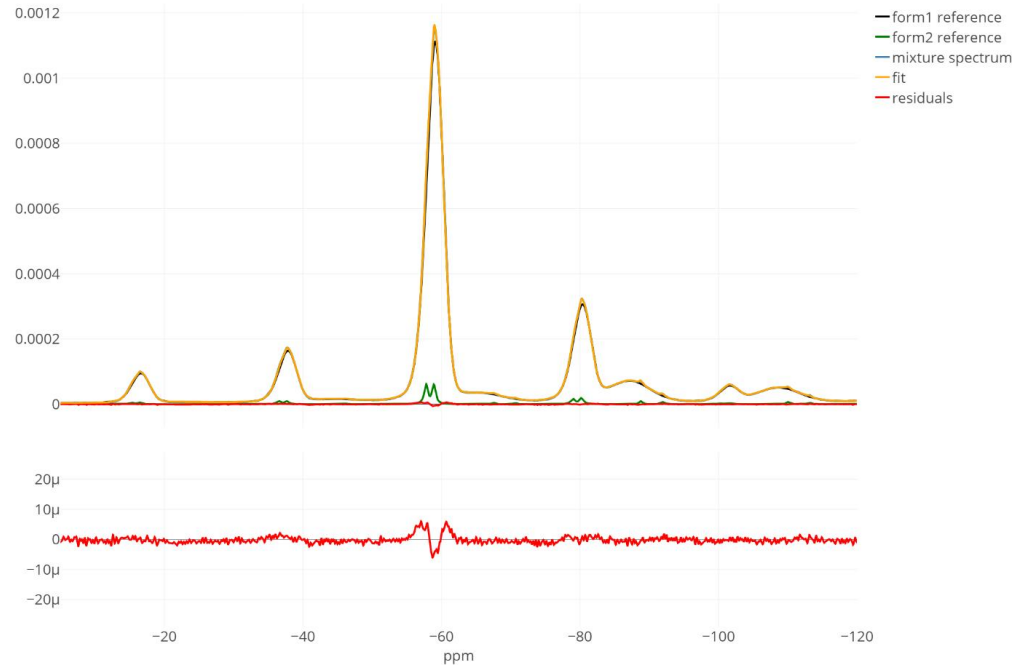
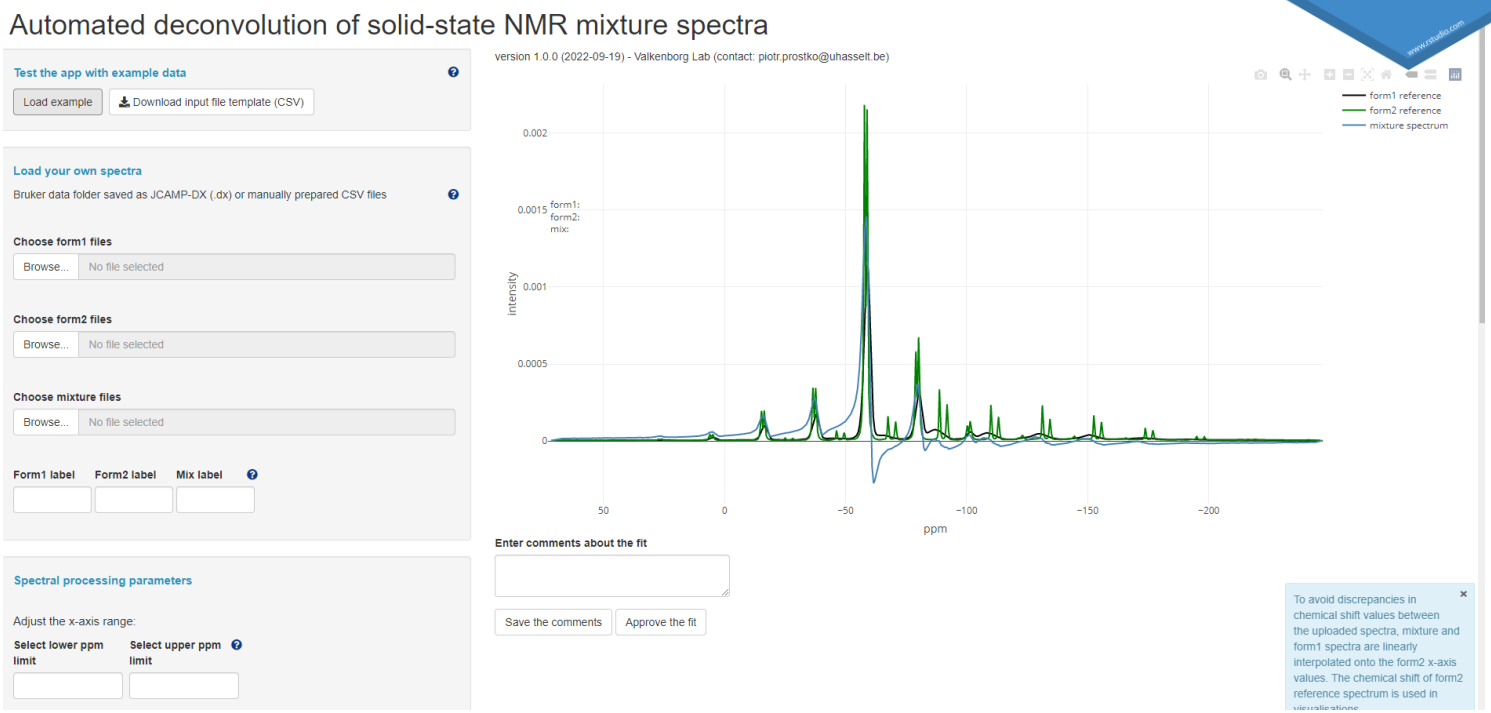




… returned 2.84% estimate and a good residual trace

Try it for yourself!



- Safe to use (data processed on-the-fly)
- Flexible and interactive
- Promotes reproducibility
- Nucleus agnostic (19F, 13C, …)

Try it for yourself!

https://valkenborg-lab.shinyapps.io/ssNMRdeconvolution/