Compact models for compact devices: Visualisation of SAR using mobile apps

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http://molmatinf.com

Modern User Experience

- Continuity from 1980s
- Mostly open architecture

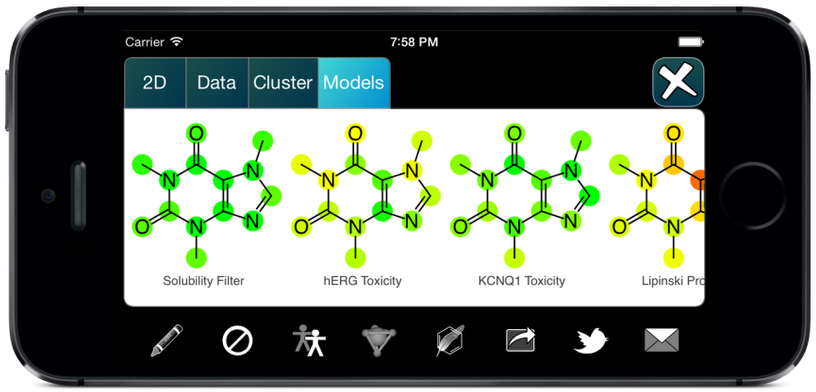
- Deploy on anything
- Very open
- Tied to server

- Small touchscreen
- Ultimate mobility
- Unitary functionality
- Company store

Mobile Particularly

Small Data

Device Local



- presentation
- visualisation
- calculation
- sharing

Medium Data

- custom content
- hard to appify

Large Data

Remote API

- searching
- registration
- online sharing
- heavy calculations

The Remoteness Problem

- User identity
- Security issues
- Maintenance burden
- Hostile user experience
  - no signal
  - foreign countries
  - planes
  - wilderness

- Very tempting to use servers for heavy lifting
- Requests via Internet API

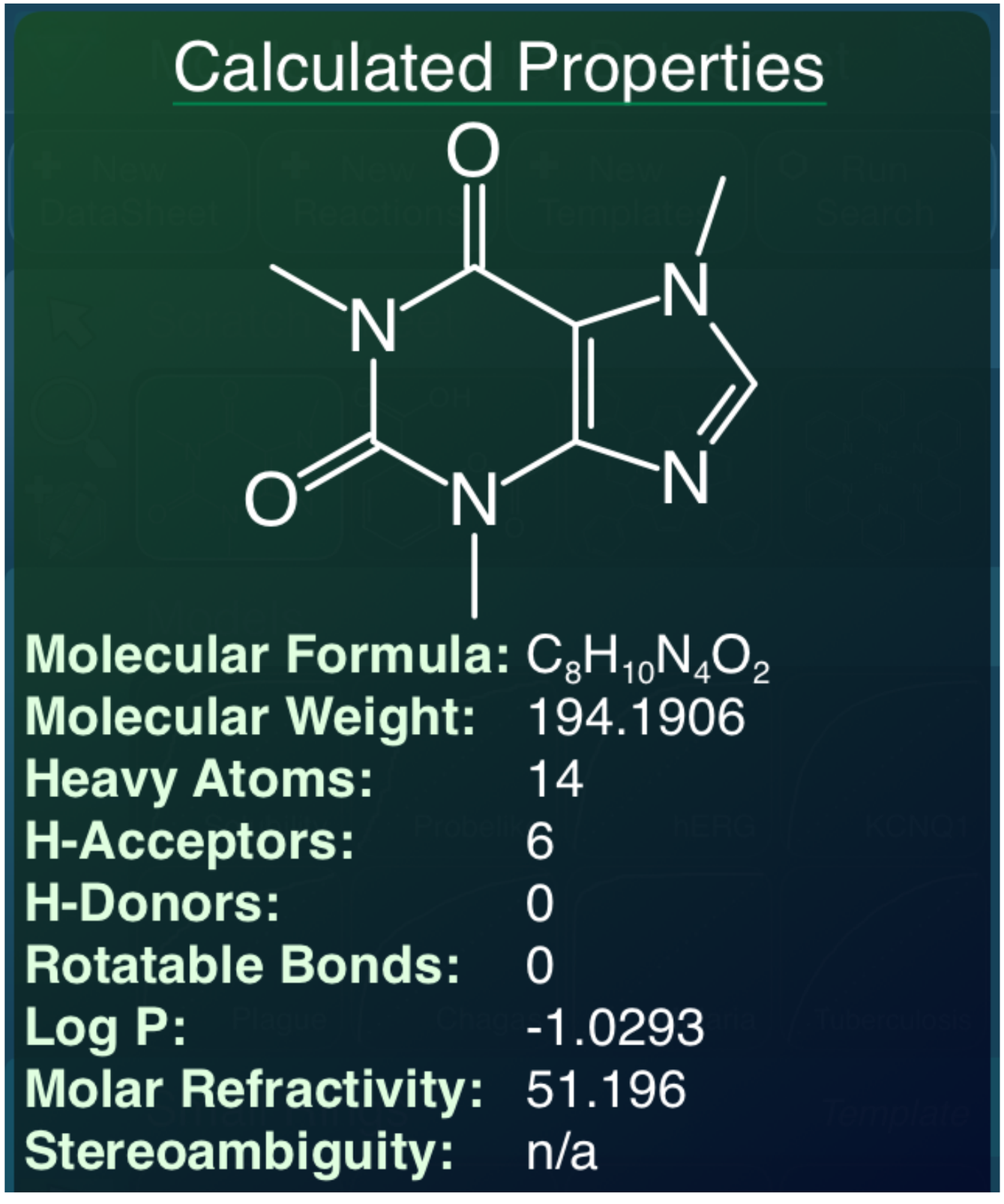
The Local Solution

- Structure ➙ Property calculation algorithms

- Start with scalars:

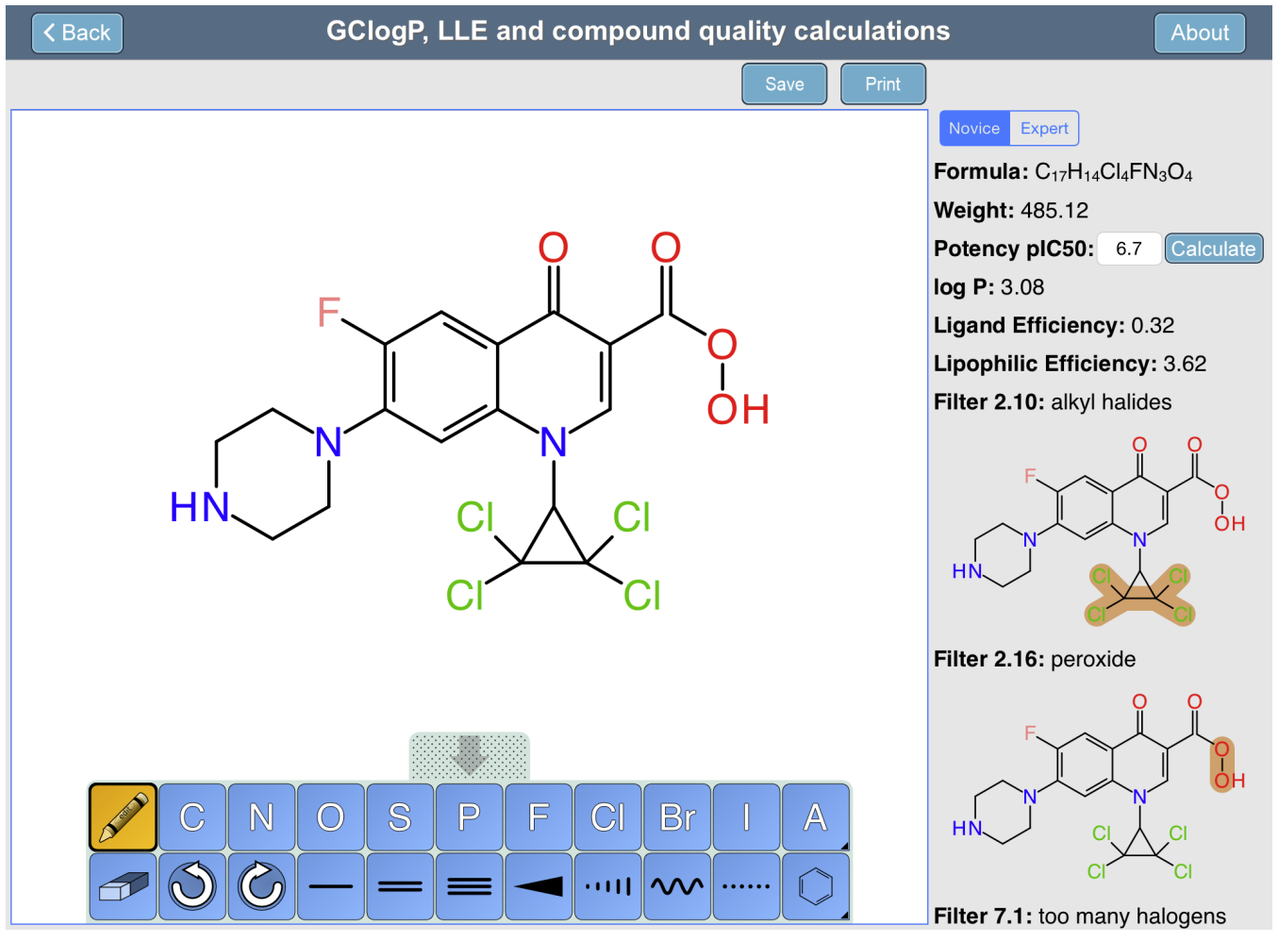
  - some are easy

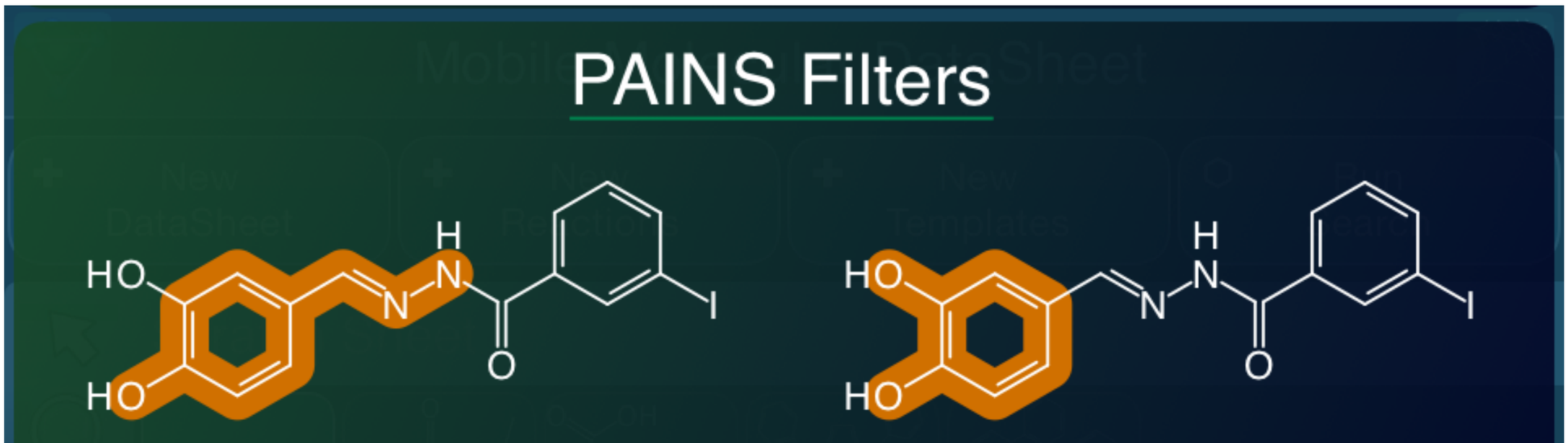
  - others less so



Substructure Filters

- **PAINS** and **AZ Filters**: both require complex recursive substructure queries
- Overlay visualisation

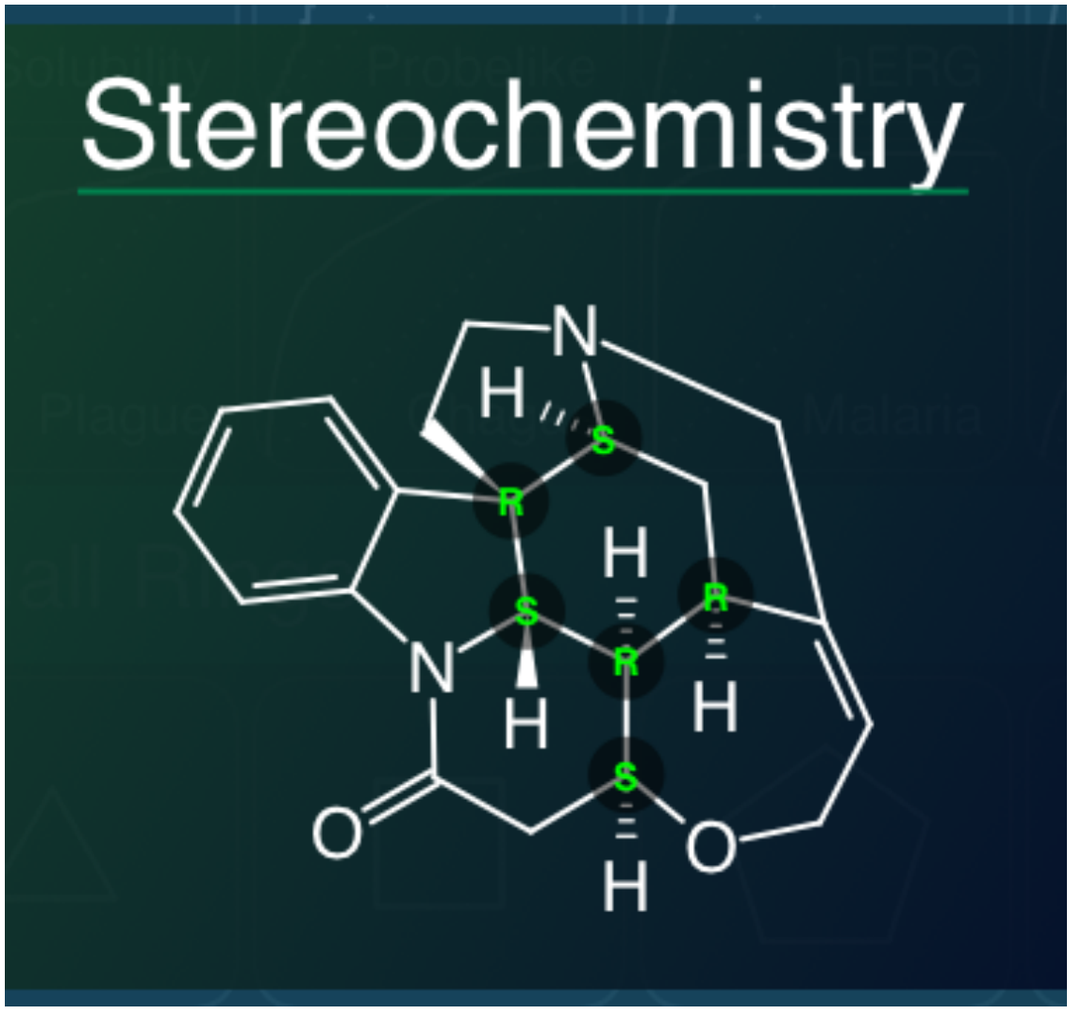


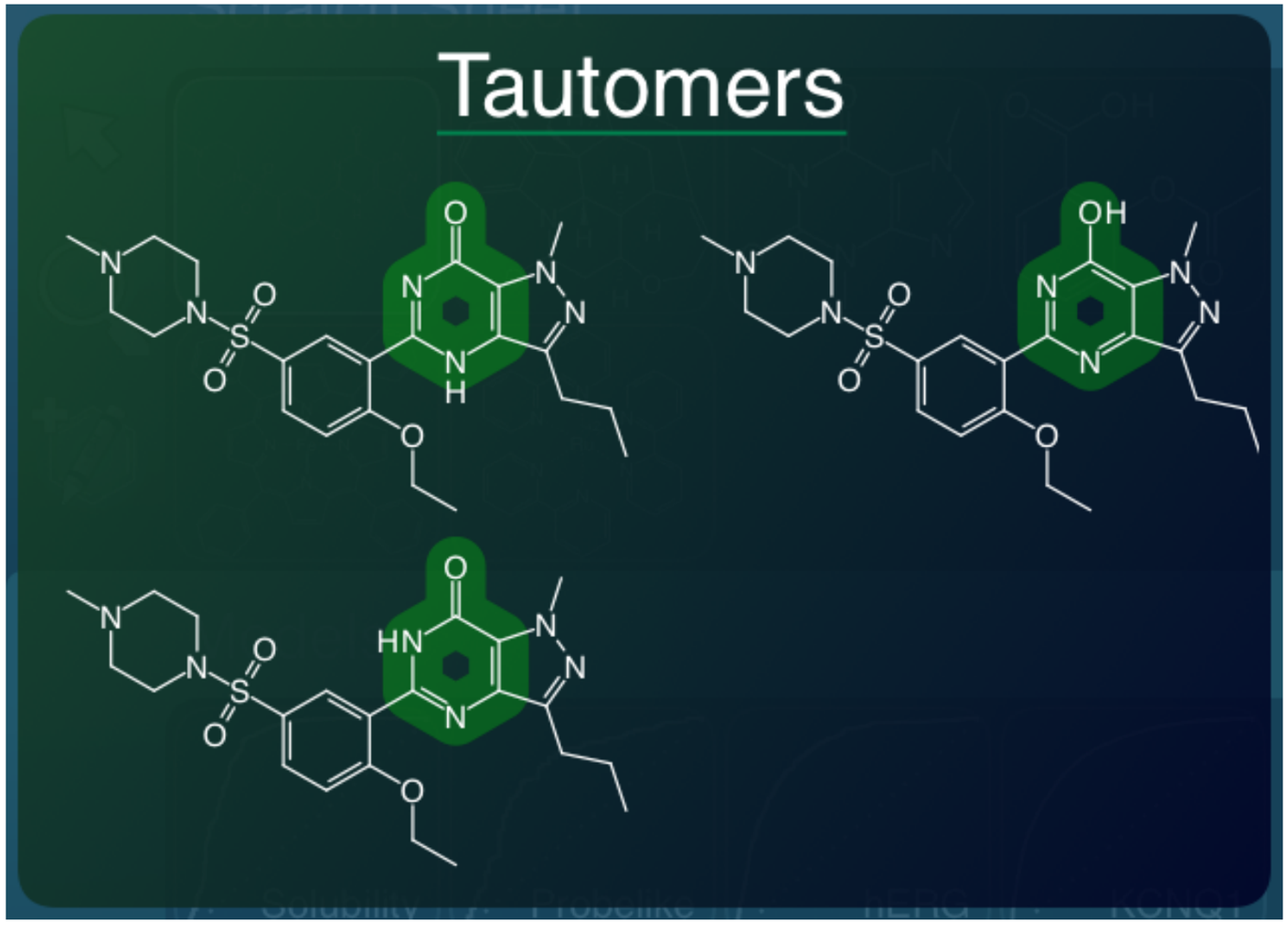


Molecule Perception

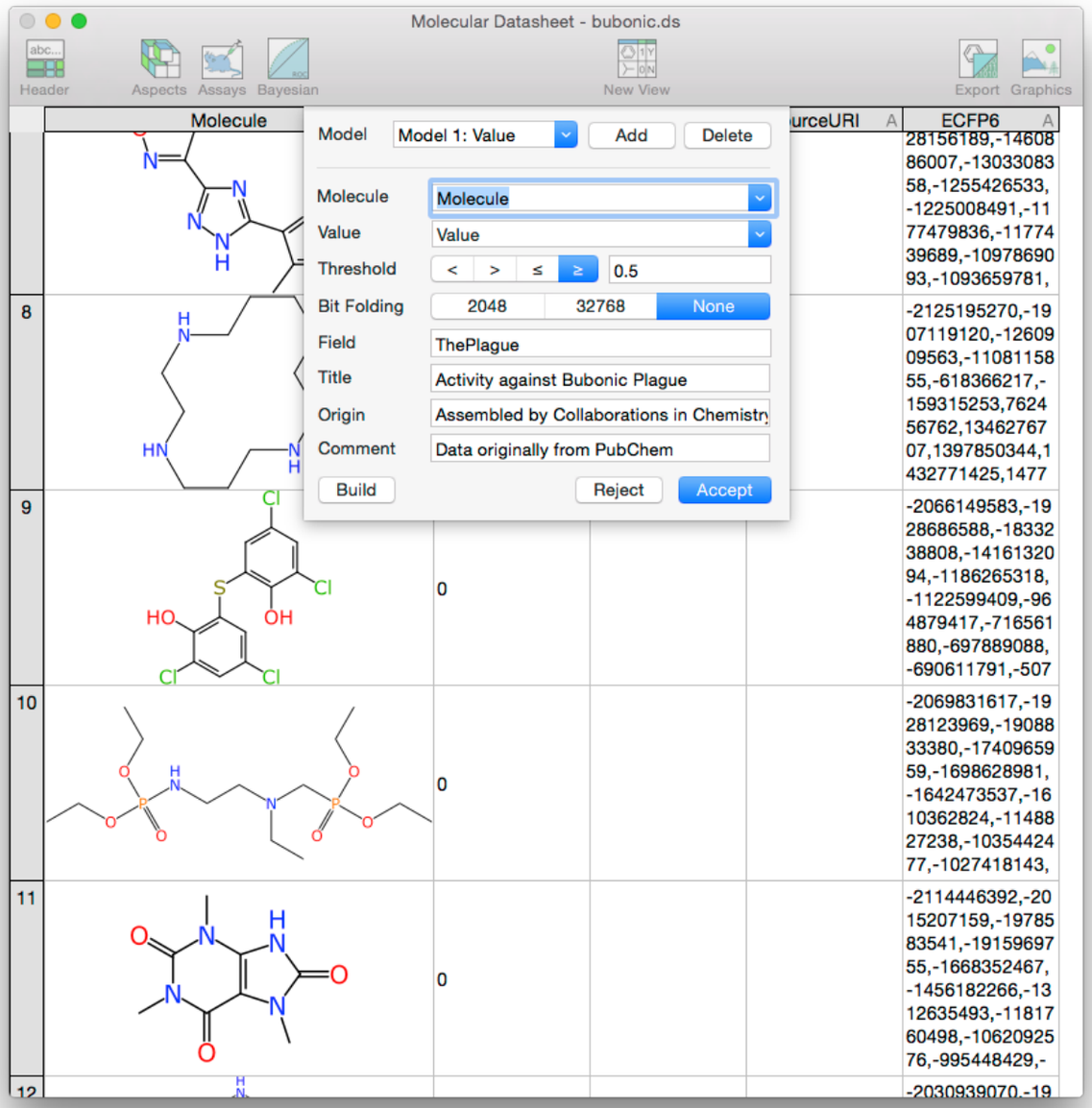
- Hardcoded algorithms for **stereochemistry** and **tautomer enumeration**

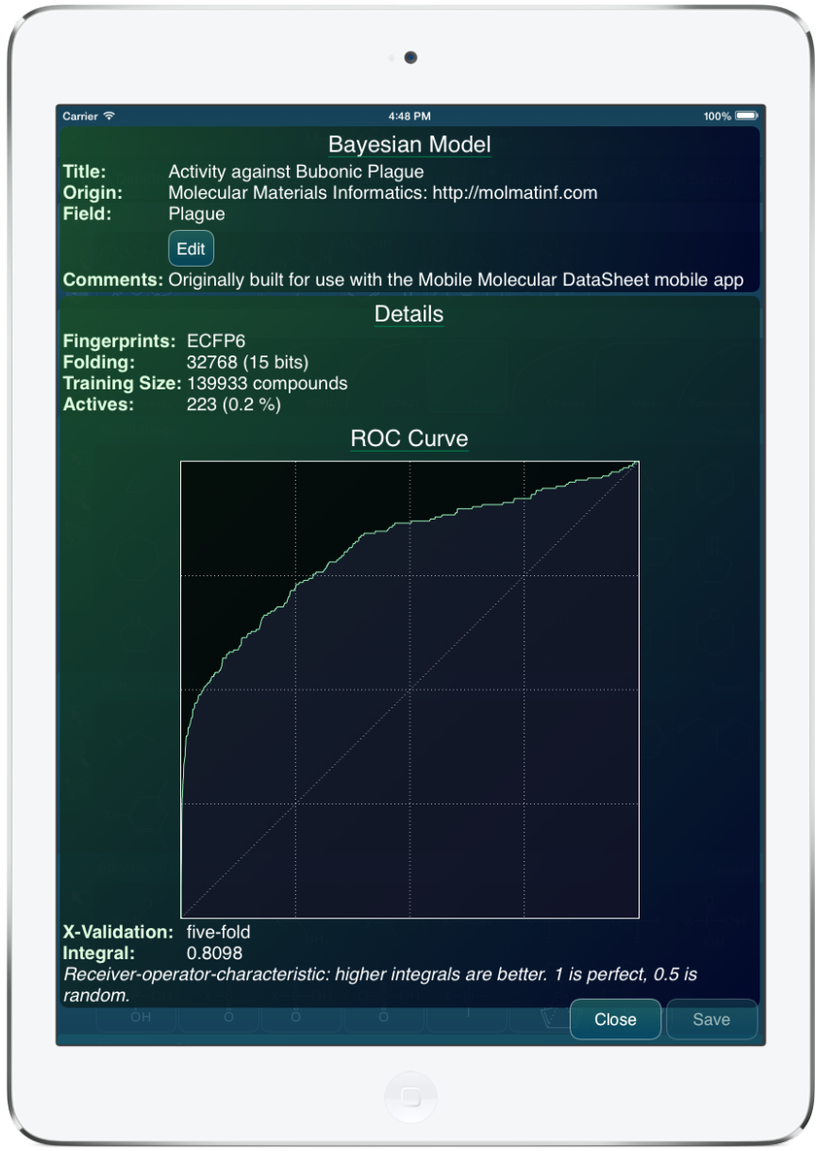
- Displayed by structure annotation





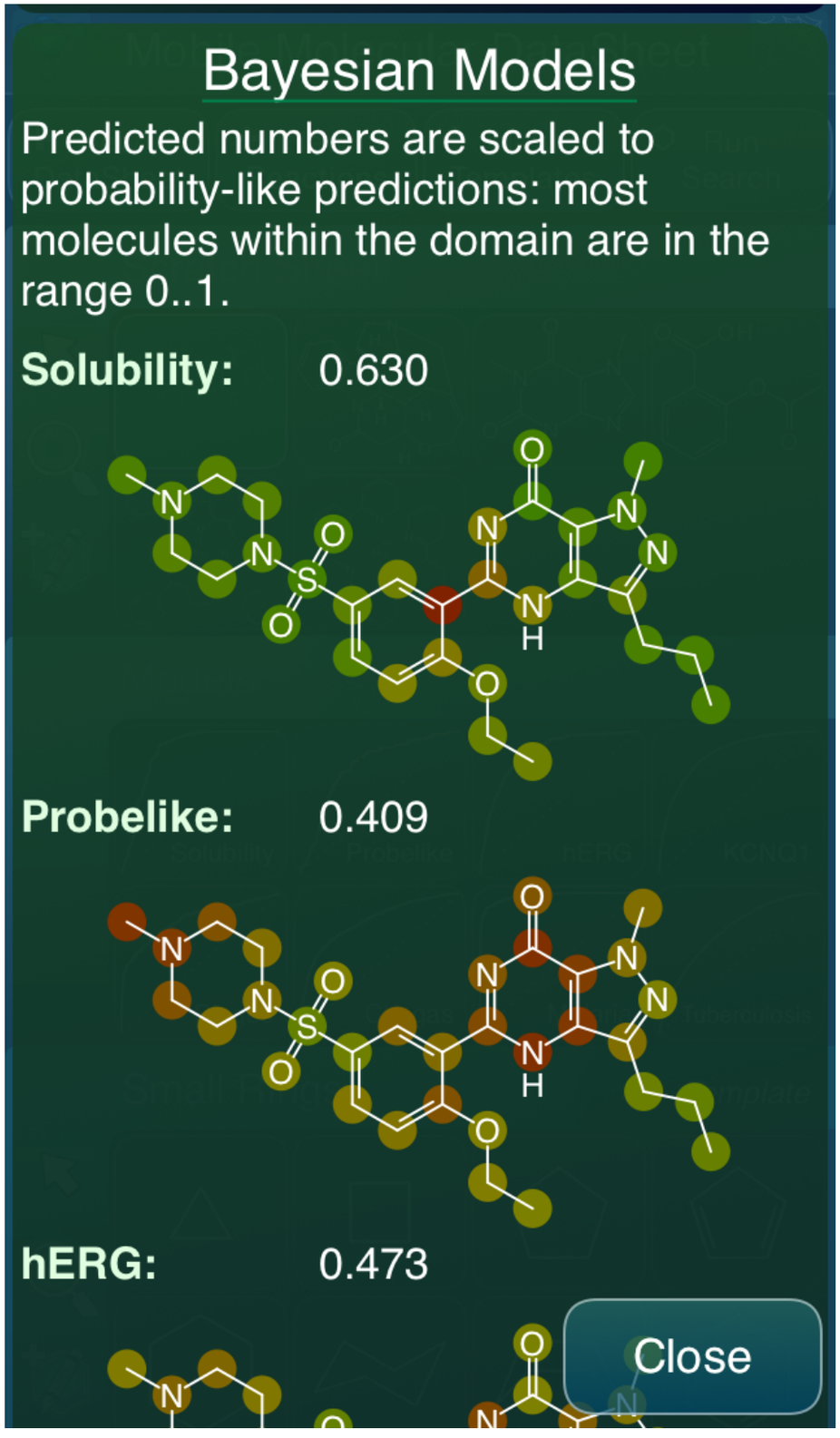
Prepare & Shrink

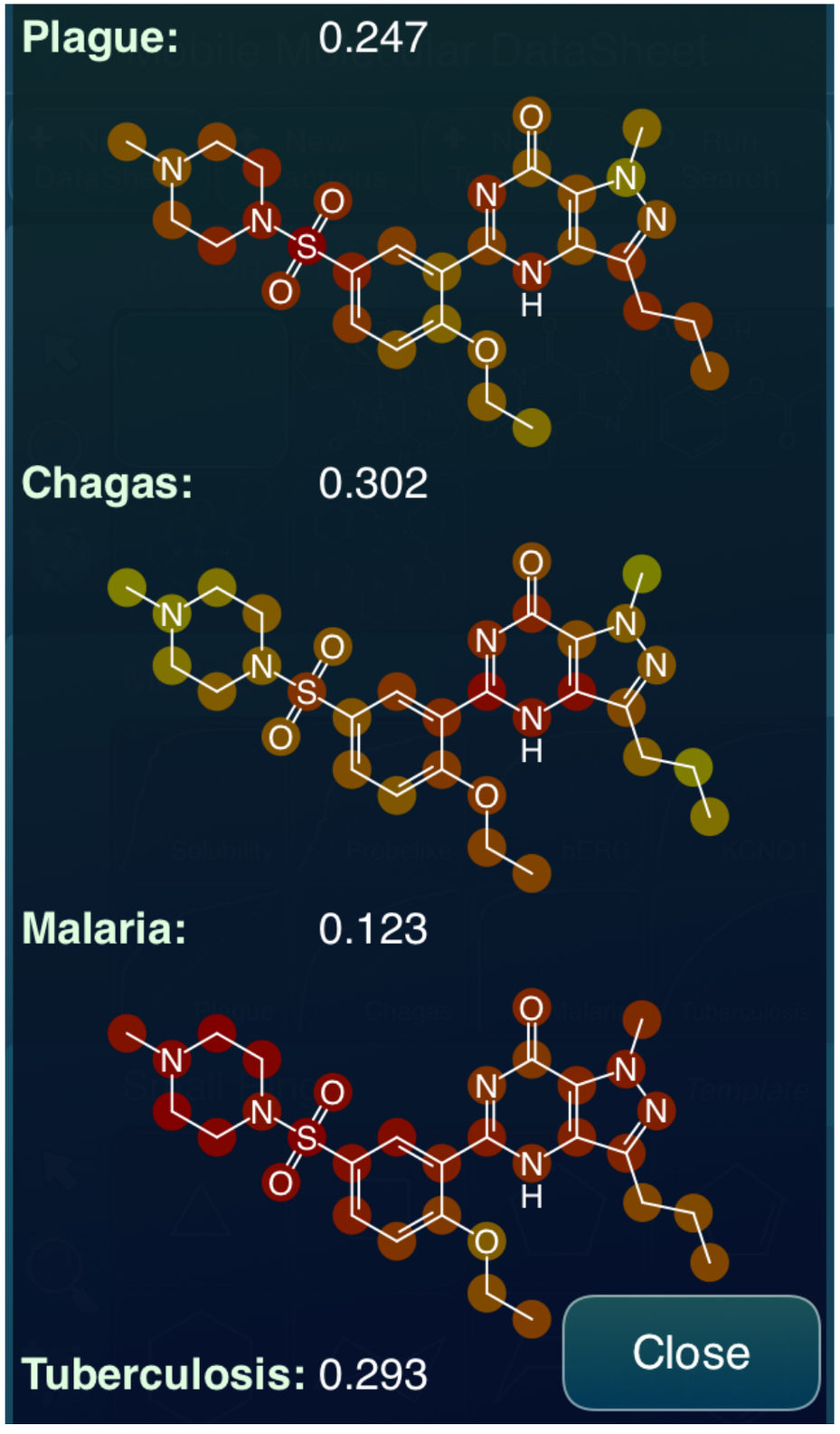




- Prepare data using desktop software (and/or of scripts)
- Build **Bayesian** (ECFP6) model: concise, portable
- Transfer model to mobile app...

Predict & Visualise





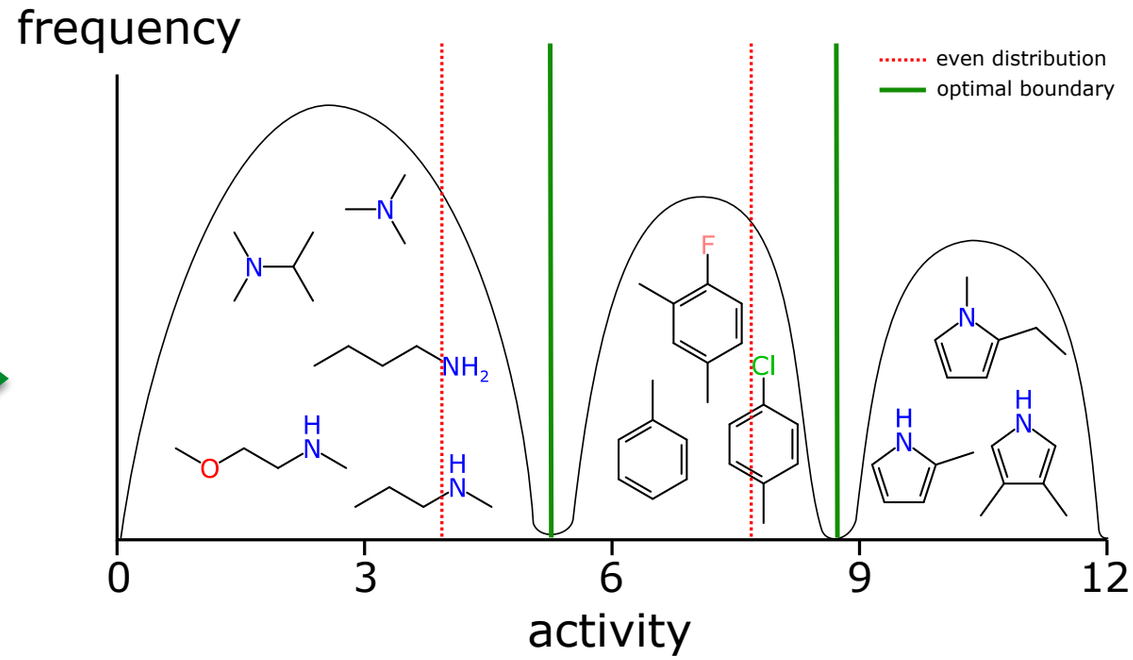
- Fast to apply
- Numeric or molecular visualisation
- Overlay uses ECFP6 fingerprints
- With one molecule or many

More is Better

ChEMBL

Target
β-Hydroxysteroid dehydrogenase
1-Acylglycerol-3-phosphate
Acetylcholine esterase
ADAM10
Adenosine A1 receptor
Adrenergic receptor α1
Aldoketo reductase
Alkaline phosphatase
Aminopeptidase N
Angiotensin converting enzyme
Anthrax lethal factor Bcl2
Arachidonate 12

~2000

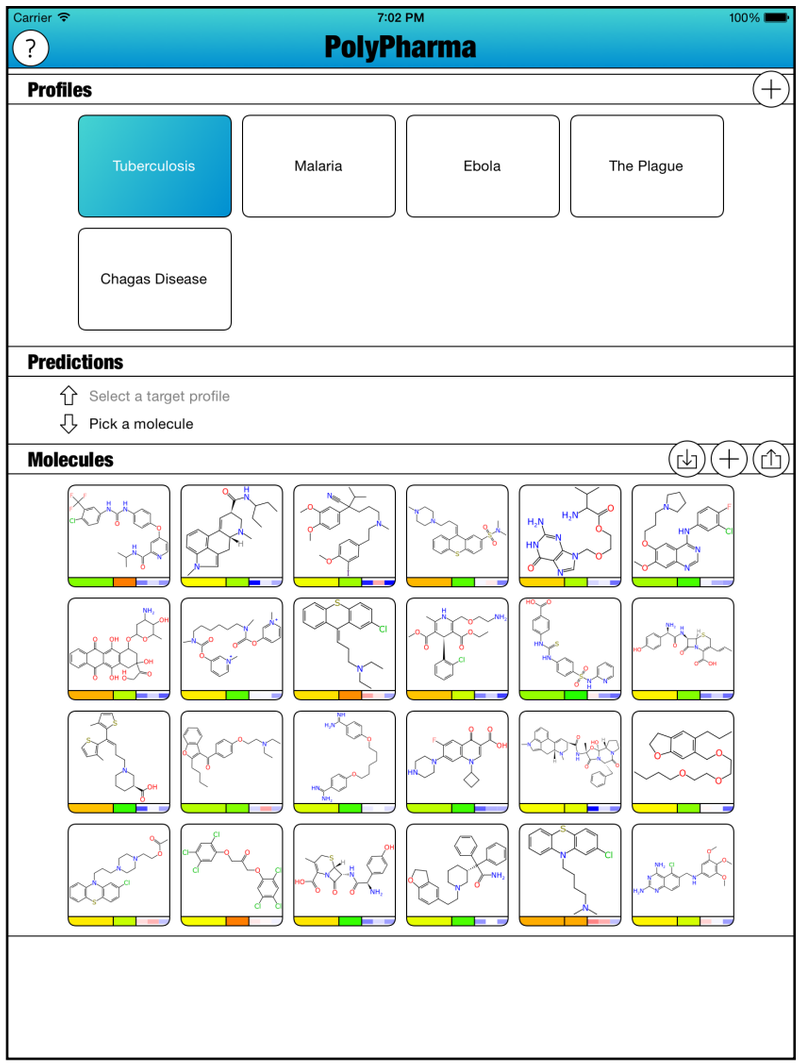


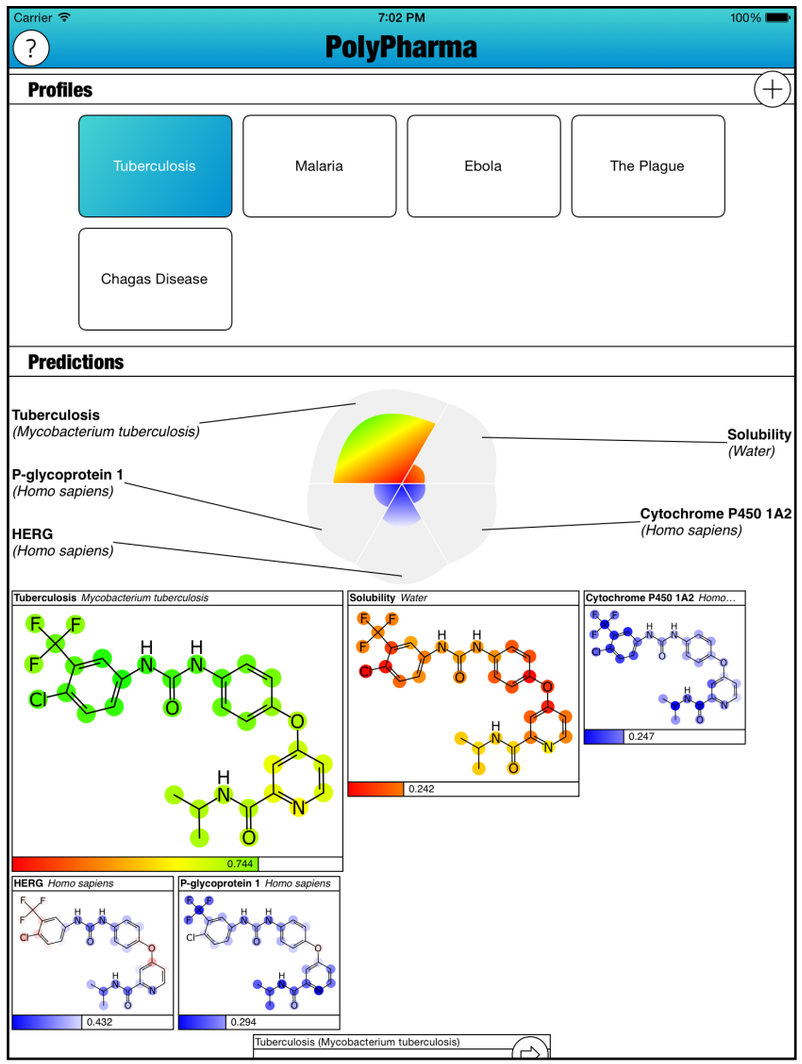
JCIM **55**, 1246-1260 (2015)

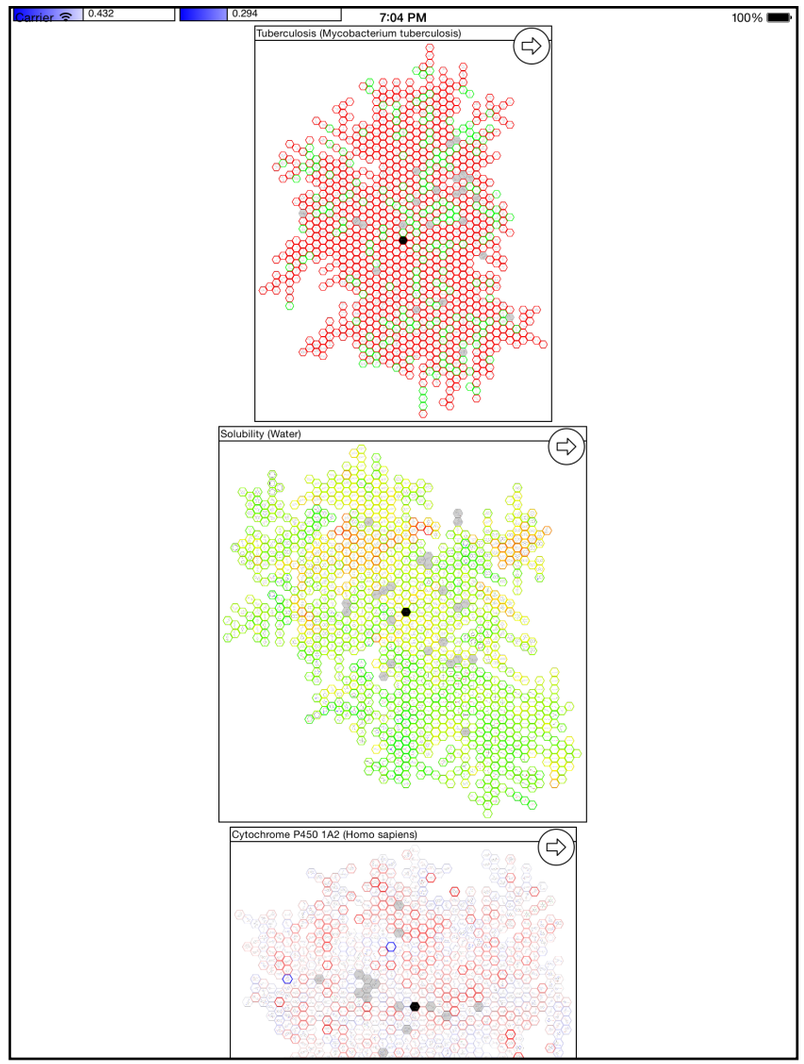
- Extract target:activity collections from ChEMBL
- Compute active/inactive boundaries
- Automatically build Bayesian models...

Extreme Appification

- PolyPharma app: work in progress
- Visualise a lot of SAR data... with 2 taps







Demo

- **PolyPharma** app demonstrated live...
- Since the meeting, the app has become available on the iTunes AppStore:

http://itunes.apple.com/app/polypharma/id1025327772

- For more information, see:

http://molmatinf.com/polypharma.html

Acknowledgments

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