Harnessing Artificial Intelligence for Precision Drug Development in blinding eye disease
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The problem: Drug Development is costly & slow

US$ 2+Bn
10 years+
The problem: Drug Development is costly & slow

US$ 2+Bn
10 years+
imprecise

http://chartpack.phrma.org/
The problem: Drug Development is costly & slow

- US$ 2+Bn
- 10 years +
- imprecise

Can be improved with a Biomarker

- 10 years +
- often linked to clinical trial success

http://chartpack.phrma.org/
The Challenge of Dry AMD:

Disease is complex
- 200+ polymorphisms influenced by lifestyle

Can’t be biopsied
- Rely on Image Based Biomarkers (IBBs)

Current IBBs are simple
- Colour & Fundus Autofluorescence (FAF)

Multiple failed clinical trials

Late clinical trials
Large clinical trials
Imagine:

Precision Drug Development

The right person in the right trial, targeting the right pathway with the right chemistry
Imagine:

**Precision Drug Development**

The right person in the right trial, targeting the right pathway with the right chemistry

**Cure**

**Interrupt**

**Predict & Prevent**
Advanced Computing for Precision Drug Development

**Image Based Biomarkers (IBBs)**
- the intersection of Clinical Trial Design & Convolutional Neural Networks & Cloud

*EU & US FDA approval
Artificial Intelligence for diabetic retinopathy screening, 2017*

**Large data “OMICs”**
- from genome to lifestyle, large data fuel Artificial Intelligence

**In silico Drug Design**
- the proteome meets medical chemistry & advanced computing
Tracery’s answer: A data-driven 3-part platform harnessing Artificial Intelligence to address blinding eye disease

Image Based Biomarkers

OMICs

Drug Design

... first focusing on Dry Age Related Macular Degeneration
Image Based Biomarkers
We see more disease:

FAF = gold standard
We see more disease:

providing the first functional imaging method
We see entirely new complex phenotypes:
We see entirely new complex phenotypes: ... permitting unprecedented classification of our patients
We see entirely new complex phenotypes:

... permitting unprecedented classification of our patients

addressing heterogeneity
We have prospective data:
We have prospective data: permitting predictive modeling
OMICs & large data handling
Phenotype-OMICs correlations: addressing biology of different cohorts

... correlating phenotypes with genotype, OMICs, & lifestyle
OMICs first: identifying cohorts with shared biology

... enabling pathway-driven molecular targeting
in silico Drug Discovery
We can evaluate Protein-Ligand interactions:

... with proteome-wide *in silico* screening of our pipeline

prioritizing IND candidates & predicting NCEs
for classification – addressing heterogeneity
for **prediction** – allowing prevention & intervention
for Precision Drug Development

Dedicated Convolutional Neural Networks

Dimensionality reduction

Hierarchical feature representations

Predictor

Disease:
- Onset
- Progression
- Complications

Precision Drug Development:
- Response
- No Response
- Adverse events
for Personalized Medicine

Dedicated Convolutional Neural Networks

Dimensionality reduction

Hierarchical feature representations

Predictor

Treatment:
- Response
- No Response
- Adverse events

Personalized Medicine:
- Cure
- Intervention
- Prevention

Tracery Features
FAF Features
OCT Features
Features
Tracery’s achievements:

www.clinicaltrials.gov
NCT02588378
NCT02909517

Awards, Non-Dilutive Funding, Intellectual Property

QuickFire Challenges
1st place: “AI for Drug Development”

Ontario Centres of Excellence

SOSCI P
Southern Ontario Smart Computing Innovation Platform

Morgan Lewis

Norton Rose Fulbright

Next steps:

... iteratively enhance computing technology
... expand through cloud

additional cohorts & increased data
# Our Team:

<table>
<thead>
<tr>
<th>Medicine Pharma Science</th>
<th>Business &amp; Strategy Pharma &amp; Biotech</th>
<th>Science HealthTech</th>
<th>AI &amp; Drug Discovery Commercialization</th>
<th>AI &amp; Image Analytics Cloud</th>
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<tbody>
<tr>
<td>Shelley Boyd MD, FRCSC</td>
<td>Paul Howes MBA, CPA</td>
<td>Ken Howling</td>
<td>Naheed Kurji MBA</td>
<td>AliKhan PhD, Engineering</td>
</tr>
<tr>
<td>Exec VP, BD &amp; Strategy</td>
<td>CFO</td>
<td>Dir Operations</td>
<td>PhD</td>
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**Tracery Ophthalmics inc**
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<th>Tracery:</th>
<th>A data-driven 3-part platform vertically incorporating AI for Precision Drug Development</th>
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<td><strong>Value Proposition:</strong></td>
<td>horizontally integrated through the cloud providing data, information &amp; answers as a service in 2 years rather than 10</td>
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**Image Based Biomarkers**

**OMICs**

**Drug Design**