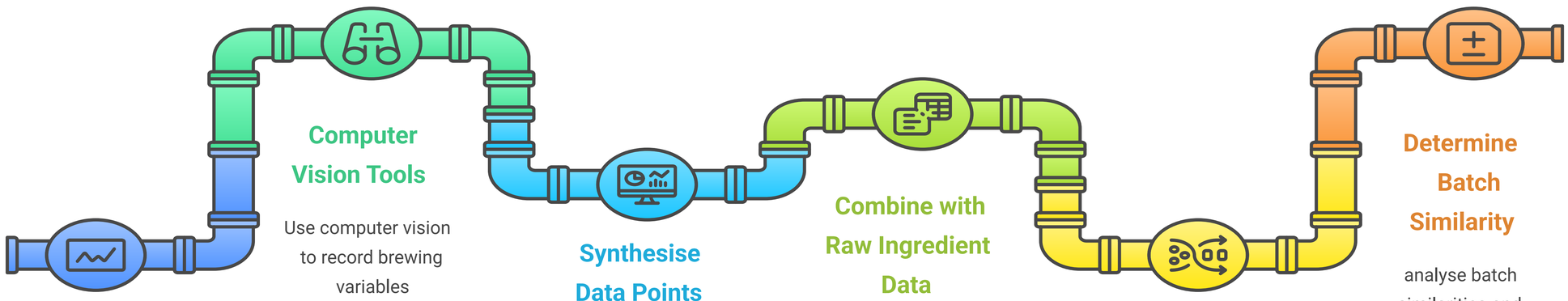
Beer AI - Tracing quality trends in your batches using machine learning



Production Metrics Aggregation

Create software to gather any live production metrics

Computer Vision Tools

Use computer vision to record brewing variables

Synthesise Data Points

Calculate inferred data points from collected metrics (against what we already know)

Combine with Raw Ingredient Data

Integrate raw ingredient data into the graph (CoA / datasheet)

Pre-populate Brew Sheets

Automatically fill brew sheets creating best of breed batch

Determine Batch Similarity

analyse batch similarities and variances

Simulate for improvement

Brewhouse Sensors

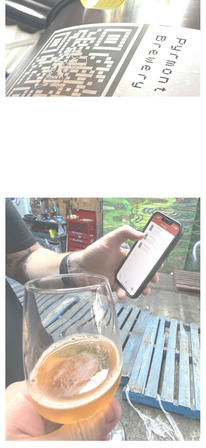
Sight glasses matching expectations?
Threshold alarms, expectation vs reality
Grant/fill ramping/transfer rates

IoT Devices Raspberry Pi + Camera + Thermocouples, Capacitance, Ultrasound...

Cellar Sensors

Cold side continual monitoring
Whiteboard photo capture/scan
Off course alarms
VDK estimations

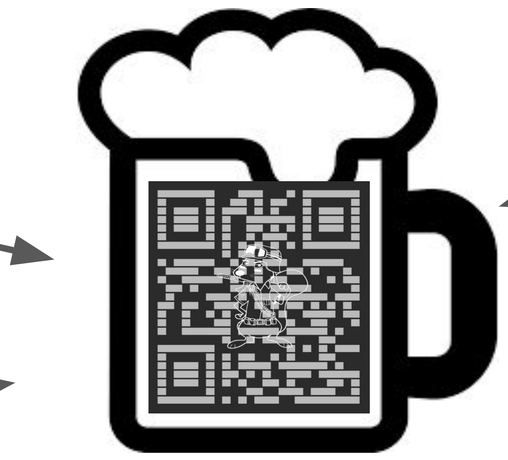
IoT Devices / Phone App



Sensory Feedback

Blind taste bias control
Fault canary and resolution tracking

Web App



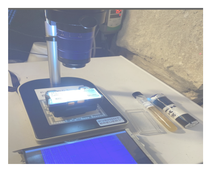
Open Source On-Premise Secure Graph Database w/ Machine Learning

Continually measure anything and everything!

Ingredient CoA Datasheet Scan

Photographic inventory recording, barcode/text reading. Specification checks

Phone Camera



Hemocytometer Viability

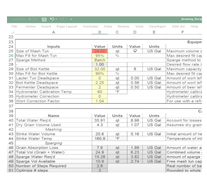
Live vs Dead Cell counter
Records actual pitching rate

IoT Device Raspberry Pi + Camera
w/ Microscope Lens

Product Ratings

How well was this batch received?
Good bot/bad bot adjustments
Tag skews from events/promotions

Web App



Smarter Brew Sheets

Pre Populated field calculations
Easy adjustments/substitutions
Flag important steps/measurements
Collaboration brewing options

Web App (Brewers phone / tablet / laptop)

Insightful Simulations

What if we did/change this... scenario projections
Multi-site brewing regional ingredient predictions
AR vessel/valve state overlays, flow/fill monitoring
Experimental brews/fault finding, tank turnaround
Seasonal market supply/demand, shared buying

Web App

How will this be achieved...

- **Brewers companion phone app with shared digital whiteboards**
  - Aids brew sheet accuracy where brewers choose to use this rather than it be imposed
  - expected valve state, sight glass flow/colour/turbidity, temp, head pressure etc
  - only need to jot down changes to what's normal, least hassle data collection
  - gentle reminders if something seems way off - brewer decides severity, app remembers their decision which might be "hey tell me earlier if you see this!"
  - options to alert other team members or automate a valve to close etc
  - scanning ingredients when used
- **Brewer choses what to share**
  - brewer remains responsible, things can stay private to them or selective team
  - easy options to redact/change/add/comment on events later
- **Use IoT devices with easy to obtain/replace budget sensors, cameras, lenses**
  - unlimited sensors, more the merrier, openness to innovation and experimentation
  - easy maintenance zero ongoing costs (no cloud compute/subscription services)
- **System self learns and adapts over time**
  - constantly assessing expectations as to what is normal
  - what is or could become out of spec unless something changes

Why do things this way, what's novel…

- **Brewers maintain their own quality standards based on what they did or didn't do**
  - Main goal here is to help not hinder the brewer to have the best information available to them on the companion app so they can make the most informed decisions and easily record any variances to what usually happens, what worked for them, what didn't
  - A remote brewer can optionally share real time knowledge to those on the brew deck
- **Open source allows anyone to extend or integrate with their existing sensors and logs** and help maintain things as a community effort
- **Production optimisation insights**
  - Sensory and sales (positive and negative) gives good batches more weight, survival of the fittest practises, brewery evolution
  - Could it be done in less time? Could you have used less resources and get same outcome?
- **Colab and multi-site brewing -** export metrics needed to exactly match a given batch in another brewery, not just get them close
- **Provides confidence to improve product diversity** gives more resistance to supply chain issues, mitigation for crop failures/disease/flooding and even trade war tariffs through measurable brewing

Pyrmont Brewery