



Global Urban Forest

Soil Health • Tree Health

The Revolution of Open Source Science – Part #2 – Calculating Tree Health

A three-part series introducing the biggest game changing development in the global Urban Forest industry

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Written by: Matthew R Daniel

Calculating a functional value of trees is the next big game changer in Urban Forestry. If a functional value for trees is achieved, the tree as a natural asset will far exceed that of an engineered footpath. Those who demonstrate expertise in tree health can contribute to a global initiative to put a premium on world best practice Urban Forestry. We are on the cusp of providing following generations with an impressive legacy based on scientific environmental baseline knowledge. In this instalment, we discuss the two current major platforms that provide scientific measurables to the Urban Forestry industry namely: Arborcheck and PhotosynQ.

Urban Forestry is a global endeavor. Some of us relocate and generally, this will be to another urban environment, so Urban Forestry is still part of our environment no matter where we reside.

Essential for improving best practice Urban Forestry is consistent funding, now and into the future.

Where does Urban Forest funding go?

- Buying trees.
- Planting trees.
- Pruning and removing trees.
- Addressing complaints from home owners.

Making sure established trees are healthy and providing the functional benefits promoted is an aspect not quantified through measurables nor widely funded. Just keeping trees alive, is not best practice. The existing tools for tracking tree data such as iTree, Tree Plotter, Open Tree Map etc., focus on tree inventory and calculation of ecosystem benefits based on a general algorithm. In the world of Urban Forestry, this focus makes sense - city councils get excited the day a tree gets planted and a speech is delivered, when a map is shared of their tree inventory through social media, and then again when figures of how much carbon will be sequestered for their annual report. After that, they don't appear to quantify measurable tree health and function.

Making tree health a priority

In short, striving for the highest state of tree health and function doesn't excite stakeholders because they can't see the benefit, and it's hard to justify an expense if the benefit isn't measurable. At most, city budgets provide arborists enough time to do 'drive-by' evaluations of trees, checking for obvious problems based on an educated subjective human

interpretation. Tree removal and pruning are the results, to ensure a perceived human risk as the priority and the driver of any reactive work.

Arborists and Urban Forest management departments are keenly aware of this, and they genuinely care about trees. Still, no one has figured out how to make quantified tree health and function a budget priority. There is a movement in the right direction. The proliferation of iTree as a global urban forest platform and developing the political will to value ecosystem benefits, carbon sequestration and reducing the Urban Heat Island effect, all increase the value of keeping trees alive. The use of drones to measure canopy density and colour means we can now plug more information into models than just "is there a tree?" --> "y/n". This approach incentivizes healthy trees and de-centivizes dying trees, but there is much more to understand.

Problems remain

Two major hurdles remain - cost and consistency. Measuring tree health and function (vigour, pest and disease identification, etc.) is expensive and requires manpower to be done well. Worse yet, baseline data is required to see changes over time, so trees need to be tracked for years to identify trends. Finally, the current set of Tree Health Assessments are varied and do not address all situations and all trees. They are usually based on a small number of observations or data sets collected by academics in isolation. There are little if any, individual tree and soil health measurables. This by no means implies those assessments are poorly thought out - just that assessments are slow to improve because

they lack direct feedback from experts in the field and the changes in the real world.

The answer: not technology



Here is where one would say "*and we have a new tech/gadget/drone/etc. that solves all these problems!*", right? Well, sort of. It is true that some can now build software to collect and share data quickly and easily, in part because everyone already has a smartphone. In addition, decreasing costs of electronics parts and simplification of manufacturing have brought down the price of scientific quality instrumentation. The [MultispeQ](#) by [PhotosynQ](#) is a good example, but more will be coming. In short - building a platform to inexpensively collect scientific-quality data and upload to Cloud for immediate analysis is now possible.

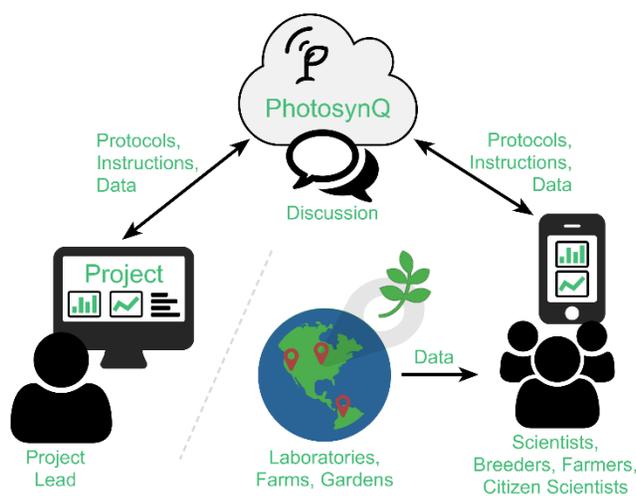


MultispeQ v 1.0

Furthermore, advances in data analysis through Machine Learning, Deep Learning Neural Networks and Artificial Intelligence (AI) are allowing computers to learn from large, complex datasets to generate useful predictions in real time.

For example, with enough pictures of cats and dogs, a computer can [tell the difference between the two](#). Healthy oak trees and sick oak trees? Same idea. In effect, we help machines learn, through experience, just like humans do. But machines learn from data **we** collect using sensors **we** control.

The real question is: who are **we**? That's not a technology question.



Open source platform –
PhotosynQ powered by "we"
(The global Urban Forest industry)

Two Futures

Right now, "we" are a Company™ such as [Arborcheck](#) with proprietary technologies for evaluating tree vigour. Those technologies require large reference datasets to calibrate the sensors, so Arborcheck controls (or licenses) users and nurseries to grow 'model' trees to build their prediction algorithms. The data is proprietary, and so is the prediction model. Most of the value created by the technology will go to Arborcheck, and whoever pays Arborcheck for the data (akin to Google and AdWords).

Competing with Arborcheck will become more expensive as Arborcheck acquires more data, so arborists will see higher prices and less competition over time. Arborcheck will be highly motivated to control and not change tree health assessment methods while keeping their reference data proprietary. Furthermore, there's no guarantee their 'standard' trees are consistent with real trees in the field. Without getting information back from actual arborists or Urban Foresters (What are the soil conditions, did the tree die or not, did it perform functional value after planting? Is it on track to increase in functional value in future?) There's no way to even tell if they are wrong. They will likely make some data or hardware public someday, but only when they have enough market control that there is no danger from the competition.

Regardless of the motivations of Arborcheck today, the long-term incentives created by that system do not favour the tree managers on the ground. This type of platform model may well be outdated, due to current computing power, disruptive technologies and emerging global collaborations based on open source.

In exchange for allowing a single company to control the future of the industry by monopolizing core data of technology, arborists get to charge for an additional service. This is the track the arboriculture community is headed down today.

Imagine instead, if machines learn from data *arborists* collect, using sensors *arborists* control, and that Urban Foresters interpret.

The arborist and Urban Forestry community could collaboratively create a public reference library using open source tools. Instead of controlling variability Arborcheck 'standard' trees, arborists could collect enough data in their normal operations to account for variability. There will be ample competition among sellers of measurement devices as the designs are public, driving down costs. By making the reference data public, anyone can create, test improvements, critique, and validate tree health assessments, and in future develop a Tree Health Calculator using a common open data platform, anyone in the community can quickly compare assessments, identify the best ones for their application, and spread successful ones quickly across the industry. Arborists and Urban Foresters could select which tree health assessment they want to use, and compare their utility in real time in the field.

Arborists have collaborated successfully before: [i-Tree](#) is an open source project collaboration. iTree is software and models which are freely provided for others to use and have massively benefited the industry by adding real value to the services arborists can provide to their customers. iTree was driven by a small group (the US Forest Service and collaborators) who saw the value in collaboration.

As with iTree, collaboration does not eliminate competition. Arborists will continue to compete for work, but that competition will occur using comparable, verifiable data collected over a lifetime. The results will be competition based on competence, experience, and skill rather than the ability to access expensive technology.

Nothing's perfect

Don't misunderstand - open platforms are not a panacea and meritocracy is not magic. Without centralized control, the community can sometimes do silly things like chasing shiny objects (or funding ['slimy objects'](#) in the case of Kickstarter). Bad actors can even cheat or try to game the system. But Urban Foresters won't be the first to address these problems: eBay, Amazon, Kickstarter and many others have developed systems to identify bad actors, motivate data sharing, validate users, and enable feedback to allow the system to self-regulate. These are known problems with functional-though-imperfect solutions.

Ultimately, it is up to the Urban Forest and arborist community to determine which future is right for them. The goal is to move the discussion away from technology - technology will happen like-it-or-not - and towards values. Do arborists and Urban Foresters want to control their own technological destiny, or do they want someone else to control it, under a user pays platform? When algorithms replace large portions of the work currently done by arborists, the same way they will [replace doctors](#) in diagnosing sickness, [lawyers](#) in navigating the legal system, and other industries without people really noticing.



Do arborists and Urban Forester's want to just be the hands collecting the data, or the collective brain guiding the system?

The Next Instalment:

[The Revolution of Open Source Science – Part # 3 - The Game Changer...PhotosynQ](#)

For more information:

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matthew@globalurbanforest.com.au