Before you start your poster, READ and FOLLOW this!

1. Learn basic design principles.

The whole point of a research poster is to make your project interesting and easy to understand. Good design is not "frosting"—it's thoughtful composition to encourage learning.

With that in mind, review these links for simple tips to make your poster as good as it can be:

- http://colinpurrington.com/tips/academic/posterdesign
- http://www.cns.cornell.edu/documents/ScientificPosters.pdf
- http://rgs.usu.edu/studentresearch/htm/skills-and-resources/great-examples/great-posters

Then, prepare your poster elements to accommodate good design:

- Brief, effective (accurate) text in easy-to-read chunks
- Simple, high-res figures and graphs

2. Use this template for your poster.

To make your job easier and to present a branded university presence, we've provided some sample posters for you to work from on the following slides. To get started, do the following:

1. Choose a slide template you want to start with.
2. Begin cutting and pasting your text into the appropriate sections. Add different headers if needed.
3. Add your high-resolution figures and graphics. Make them the focal point of the poster.
4. Tweak your elements to make them fit, but maintain the following:
    - Text size- If it doesn't all fit, edit the text down; don't make the text tiny.
    - Alignment
    - White space
    - Calibri font
    - Color palette included in this document

Characterization of Essential Oils Through Artificial Intelligence

Avery Smith
University of Utah

Ben Bunes
University of Utah

I. Introduction

Essential oils are enjoyed by millions for mental and physical health purposes. Over 3,000 different compounds comprise these oils. The ability to characterize the chemical make-up of these complex mixtures can improve formulation and quality assurance.

A data revolution is at hand with new sensors becoming exponentially more effective and cheap. These sensors can produce data that is informative to make smarter decisions and transition into smart manufacturing.

In this work, fifteen different essential oils were tested on the Vaporsens Pilot (a novel chemical sensing system based on nanofiber sensors). The chemical fingerprints obtained by this system were then analyzed using artificial intelligence algorithms to classify and characterize the oils and their component make up. A visual map of this characterization is presented and can be used by doTERRA to predict the make-up of an unknown essential oil, test reproducibility of manufacturing, further understand the chemical relations between different chemical families, and evaluate oil quality.

Table 1- A simple way to display numbers and figures

Column 1	Col. 2	Col. 3	Col. 4
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II. Methods

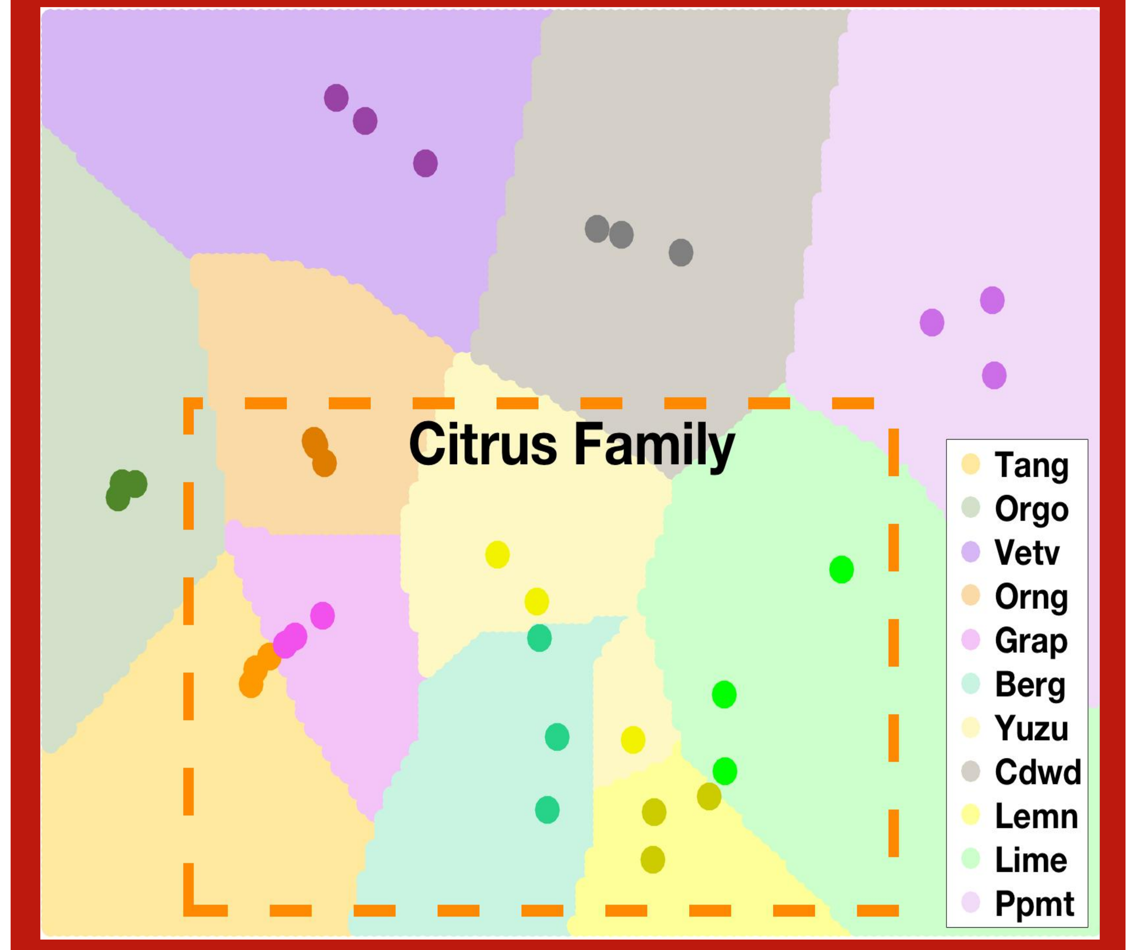
Lemon, lime, yuzu, bergamot, grapefruit, tangerine, orange, vetiver, cedarwood, peppermint, and oregano essential oils from doTERRA inc were tested in a uniform environment. Three equally timed exposures were injected into the Vaporsens Pilot using a custom vapor delivery system. The data was collected and preprocessed to capture the key data points. Those data points were then further processed using a dimensionality reduction technique and later grouped using an artificial intelligence algorithm.

III. Results

The classification models created had 100% accuracy on the initial essential oils meaning we were able to predict an unknown oil with no errors. The map obtained allows us to not only see the accuracies of the classification, but also the inherent characteristics of the oils. It gives a deeper insight into how the different chemicals are related. We can see two distinct regions: an innard group of citrus fruits, and an outer circle of non-citrus, herb and wood based oils. We can also see that tangerine, grapefruit, and orange cluster close while lemon, lime, and bergamot cluster as a family.

Figure 1 – Make these boxes your focal points

Figure 2 – Use great photos, charts and graphics



IV. Conclusions

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THE UNIVERSITY OF UTAH

Special thanks to Vaporsens, Department of Material Science and Engineering, doTERRA, University of Utah Undergraduate Research Opportunities Program

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University of Utah
Chemical Engineering
averyjs@gmail.com

Smart Manufacturing of Essential Oils Through Artificial Intelligence

Avery Smith, *University of Utah* | Ben Bunes, *University of Utah*

I. Introduction

Essential oils are enjoyed by millions for mental and physical health purposes. Over 3,000 different compounds comprise these oils. The ability to characterize the chemical make-up of these complex mixtures can improve formulation and quality assurance.

A data revolution is at hand with new sensors becoming exponentially more effective and cheap. These sensors can produce data that is informative to make smarter decisions and transition into smart manufacturing.

In this work, fifteen different essential oils were tested on the Vaporsens Pilot (a novel chemical sensing system based on nanofiber sensors). The chemical fingerprints obtained by this system were then analyzed using artificial intelligence algorithms to classify and characterize the oils and their component make up. A visual map of this characterization is presented and can be used by doTERRA to predict the make-up of an unknown essential oil, test reproducibility of manufacturing, further understand the chemical relations between different chemical families, and evaluate oil quality.

Special thanks to Vaporsens, doTERRA Department of Material Science and Engineering, University of Utah Undergraduate Research Opportunities Program

Avery Smith
University of Utah
Chemical Engineering
averyjs@gmail.com

II. Methods

Lemon, lime, yuzu, bergamot, grapefruit, tangerine, orange, vetiver, cedarwood, peppermint, and oregano essential oils from doTERRA inc were tested in a uniform environment. Three equally timed exposures were injected into the Vaporsens Pilot using a custom vapor delivery system. The data was collected and preprocessed to capture the key data points. Those data points were then further processed using a dimensionality reduction technique and later grouped using an artificial intelligence algorithm.

III. Results

The classification models created had 100% accuracy on the initial essential oils meaning we were able to predict an unknown oil with no errors. The map obtained allows us to not only see the accuracies of the classification, but also the inherent characteristics of the oils. It gives a deeper insight into how the different chemicals are related. We can see two distinct regions: an innard group of citrus fruits, and an outer circle of non-citrus, herb and wood based oils. We can also see that tangerine, grapefruit, and orange cluster close while lemon, lime, and bergamot cluster as a family.

Figure 1 – Essential Oil Characterization Map

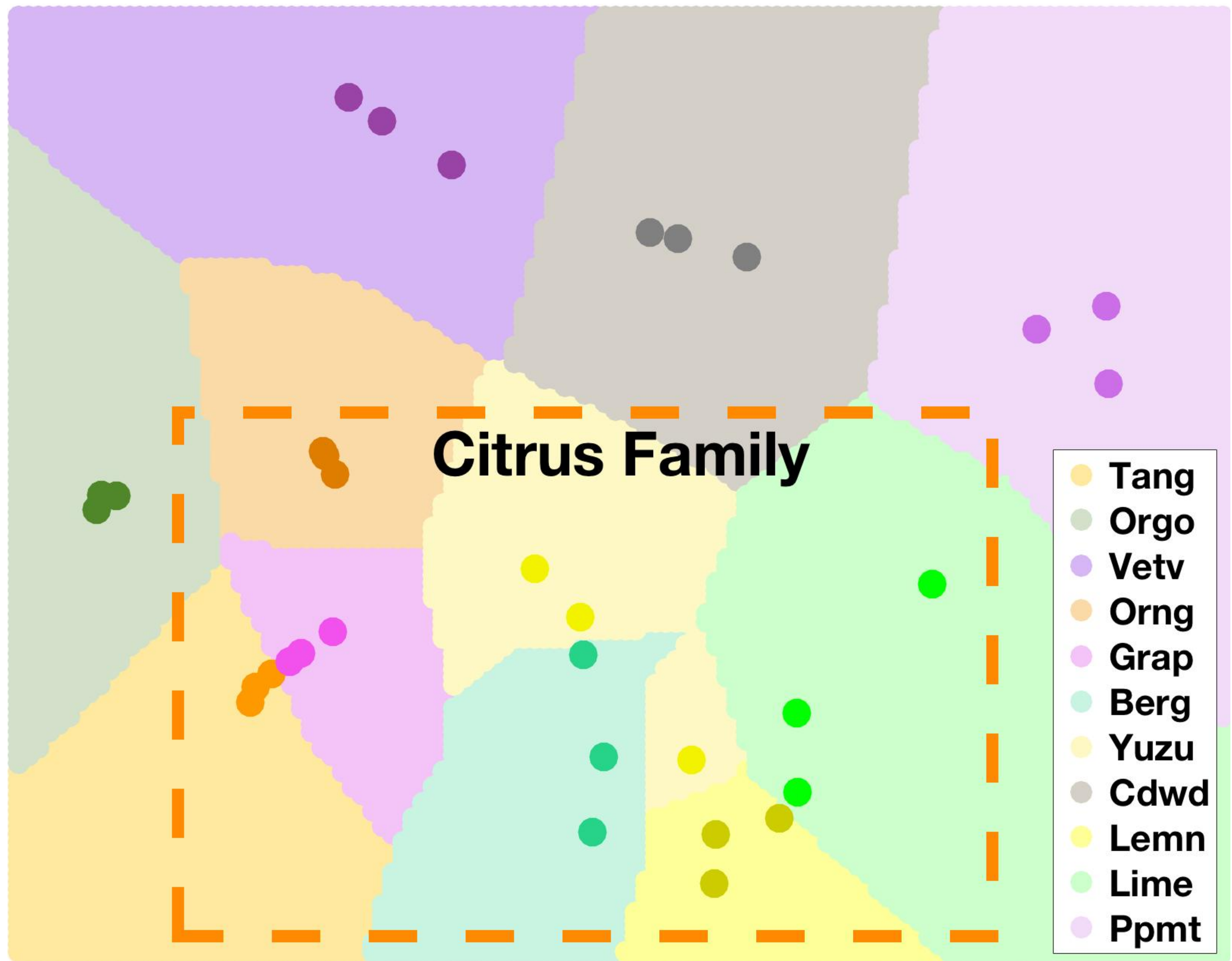
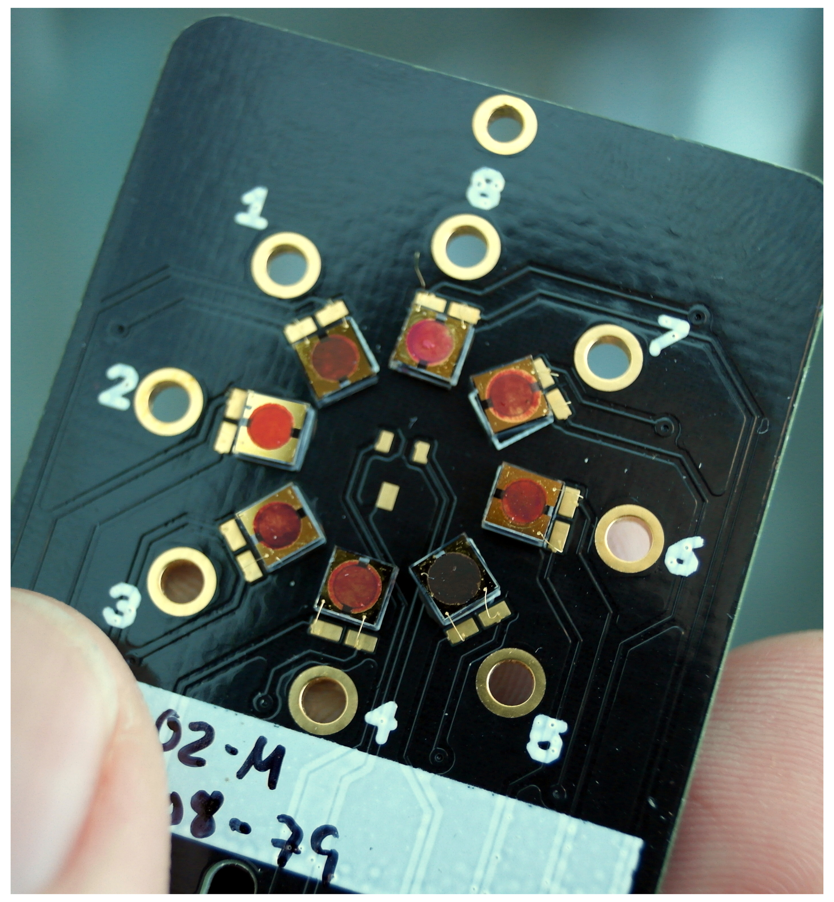


Figure 2 – Essential Oi

Figure 3 – Vaporsens Sensing Unit



IV. Conclusions

This type of technology can improve the development and manufacturing of essential oils, and has implications in other manufacturing sectors. The eleven oils were classified 100% correctly and a system including a visual map was developed to allow doTERRA to predict the contents of new essential oils, test reproducibility, further understand relations of chemical families, and even evaluate oil quality.

THE UNIVERSITY OF UTAH

Characterization of Essential Oils Through Artificial Intelligence

Avery Smith, *University of Utah* | Ben Bunes, *University of Utah*

I. Introduction

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II. Methods

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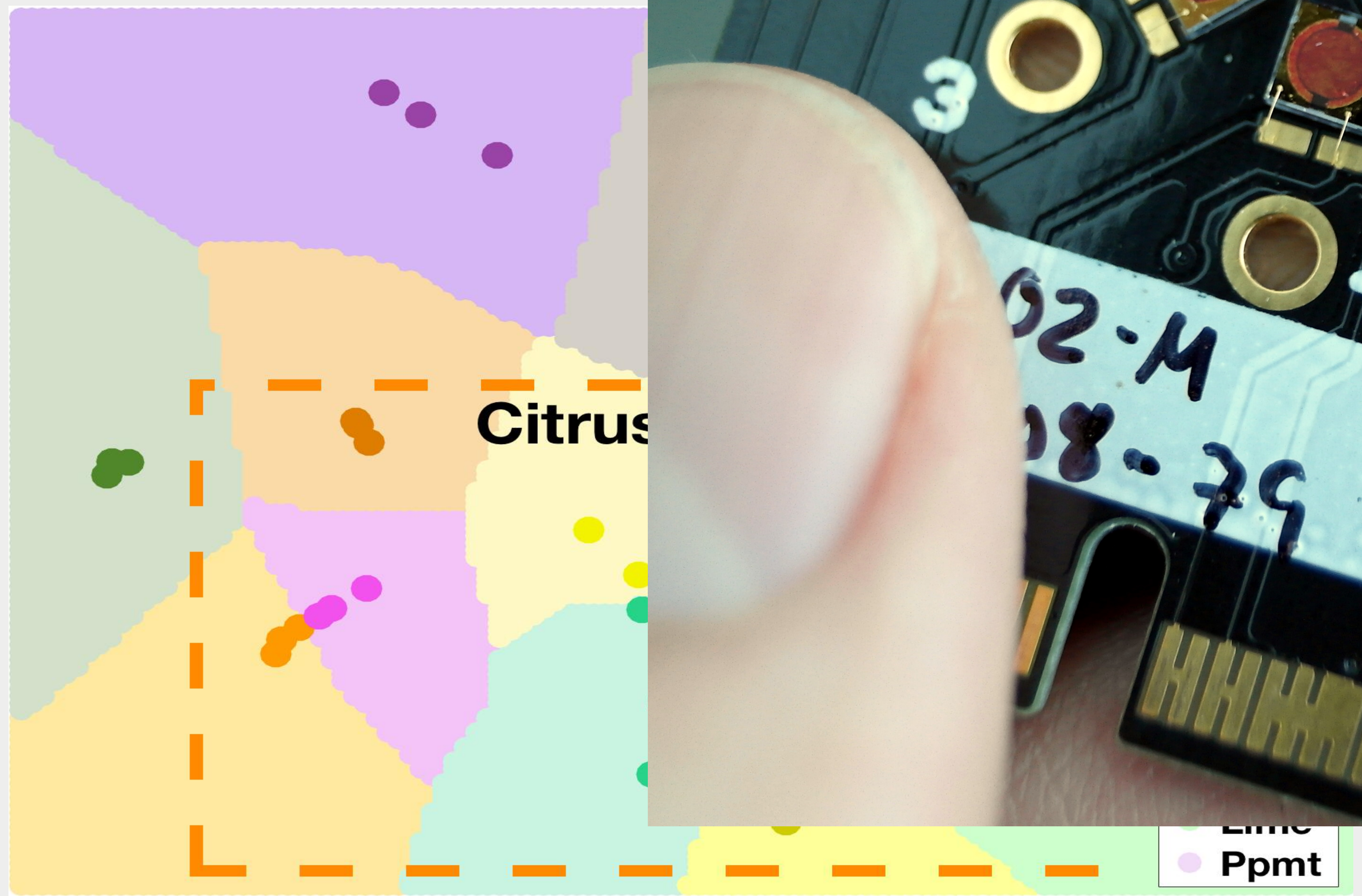
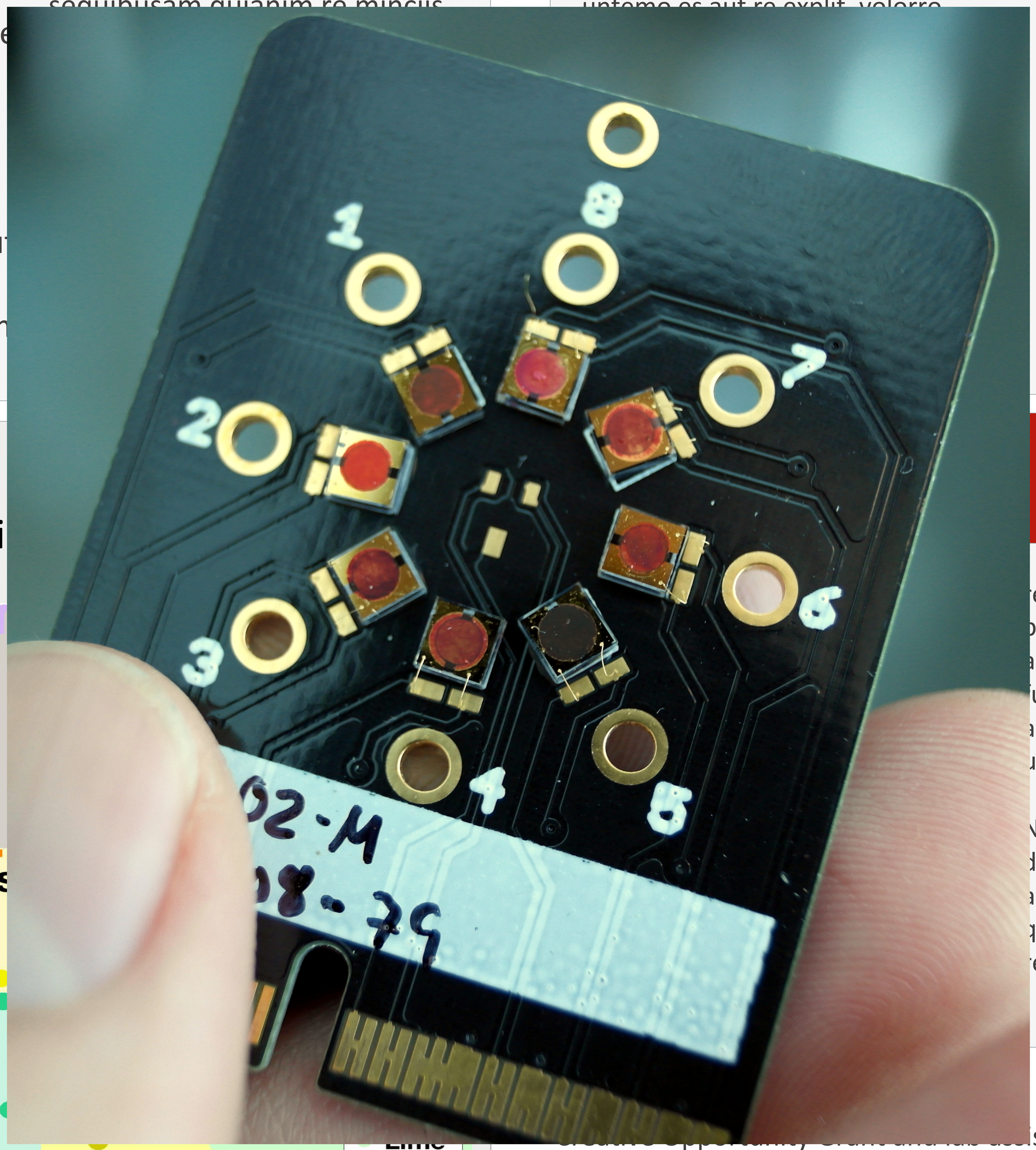
Figure 1 – Essential Oi





III. Results

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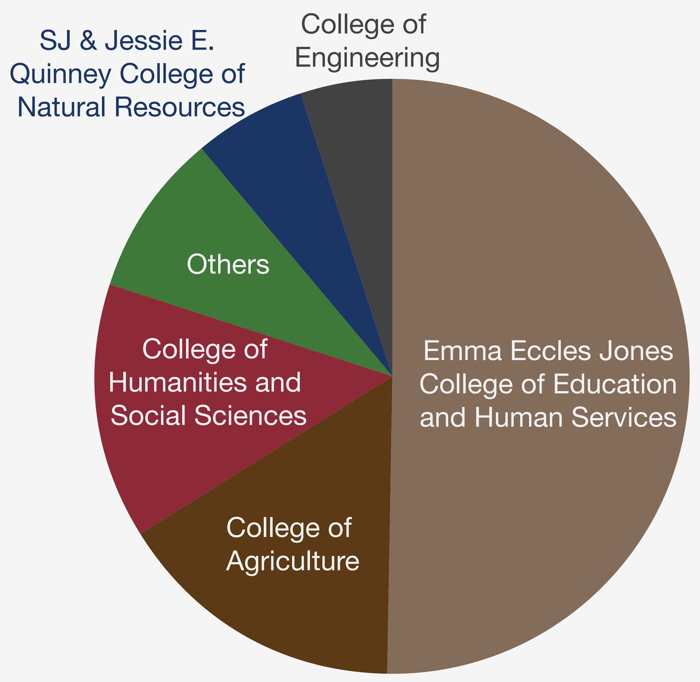

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