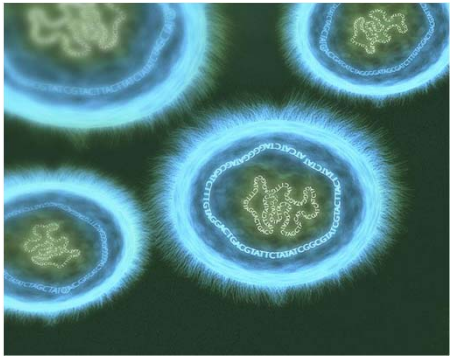
MetQy: an R package to aid the design of synthetic microbial communities

Andrea Martinez Vernon

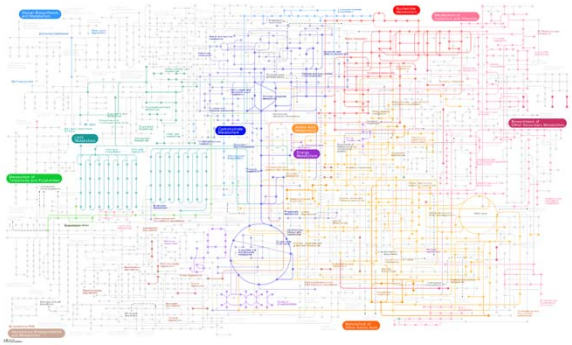
Supervisor: Prof. Orkun Soyer

AgroSpace-MELiSSA Workshop

Constraints on metabolism



Genetic capability[§]

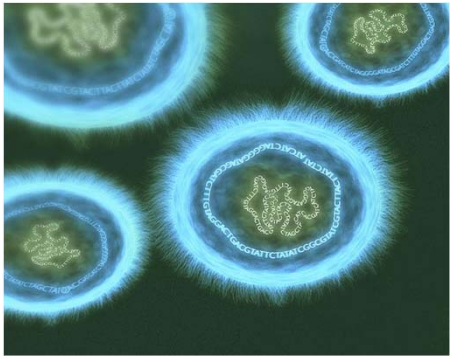


Reactions[*]

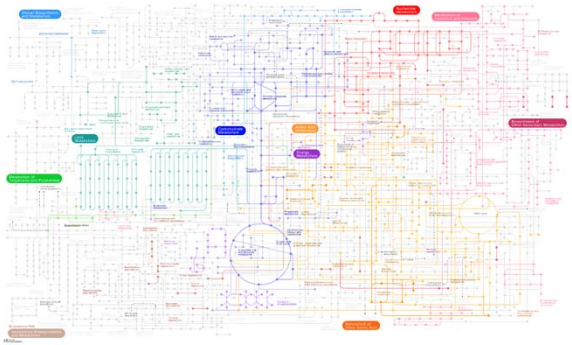
Organism's metabolism

[§]Equinox Graphics, https://fineartamerica.com/profiles/science-photo-library.html
[*]KEGG atlas; Kaneisha Laboratories

Constraints on metabolism



Genetic capability[§]



Reactions[*]

Organism's metabolism

Microbial interactions and metabolic diversity

Computational approach

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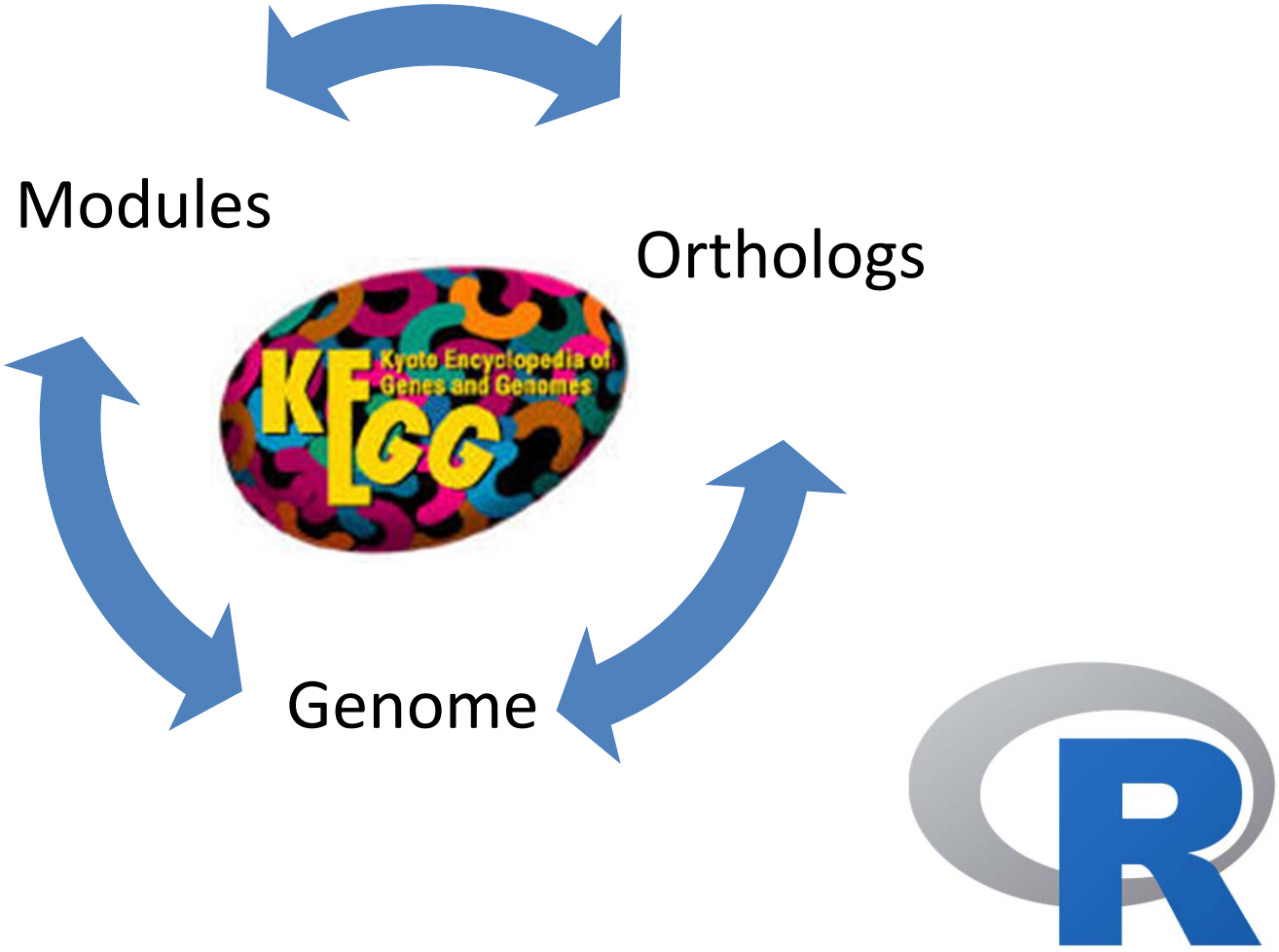
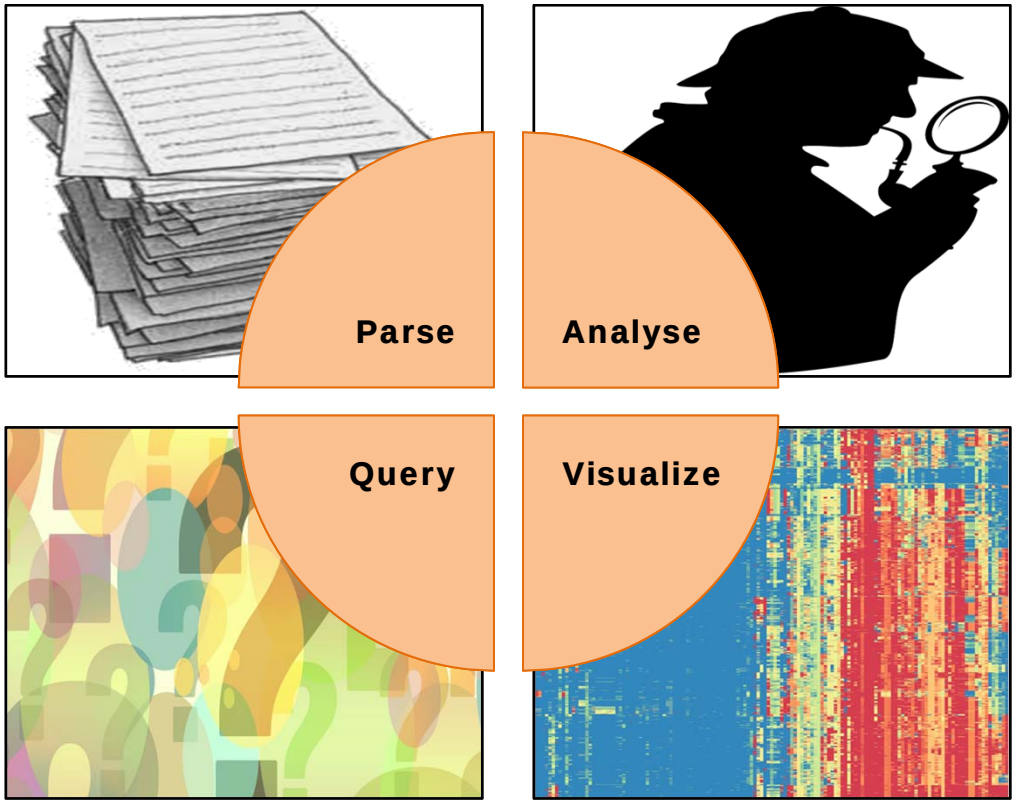
Modules

Orthologs

Genome


Modules
Orthologs
Kyoto Encyclopedia of Genes and Genomes
KEGG
Genome
R

MetQy function families

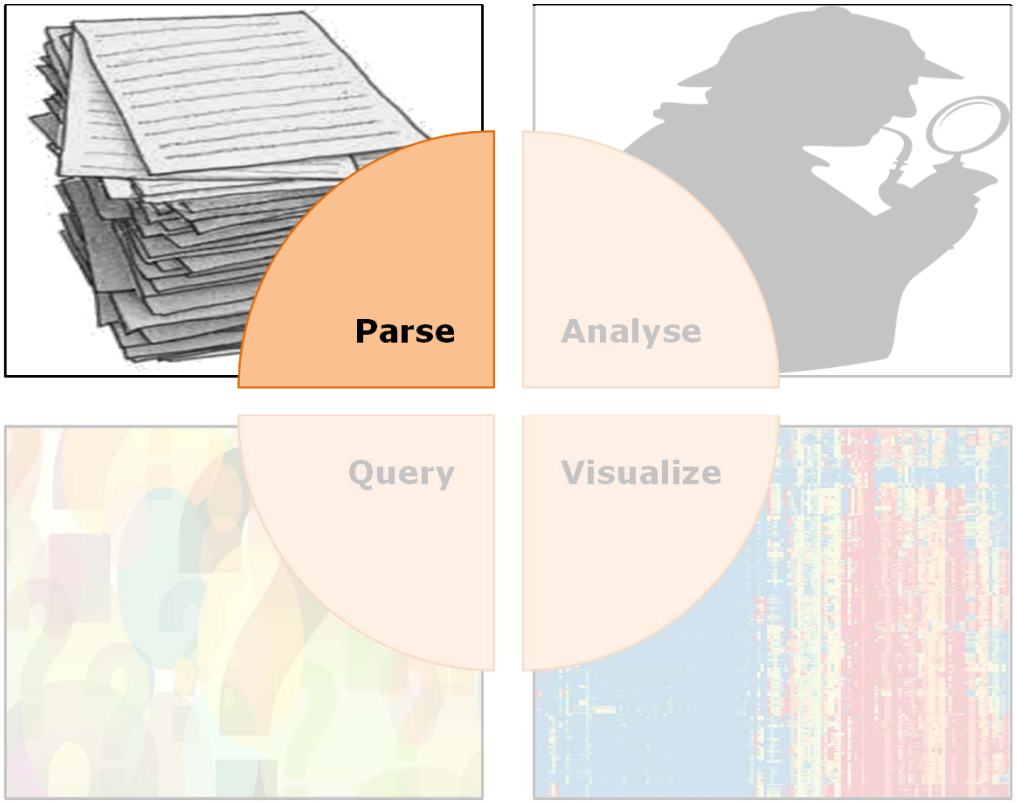


R package

github.com/OSS-Lab/MetQy

bioRxiv
Martinez-Vernon et al. *Under revision.* doi: https://doi.org/10.1101/215525

MetQy function families



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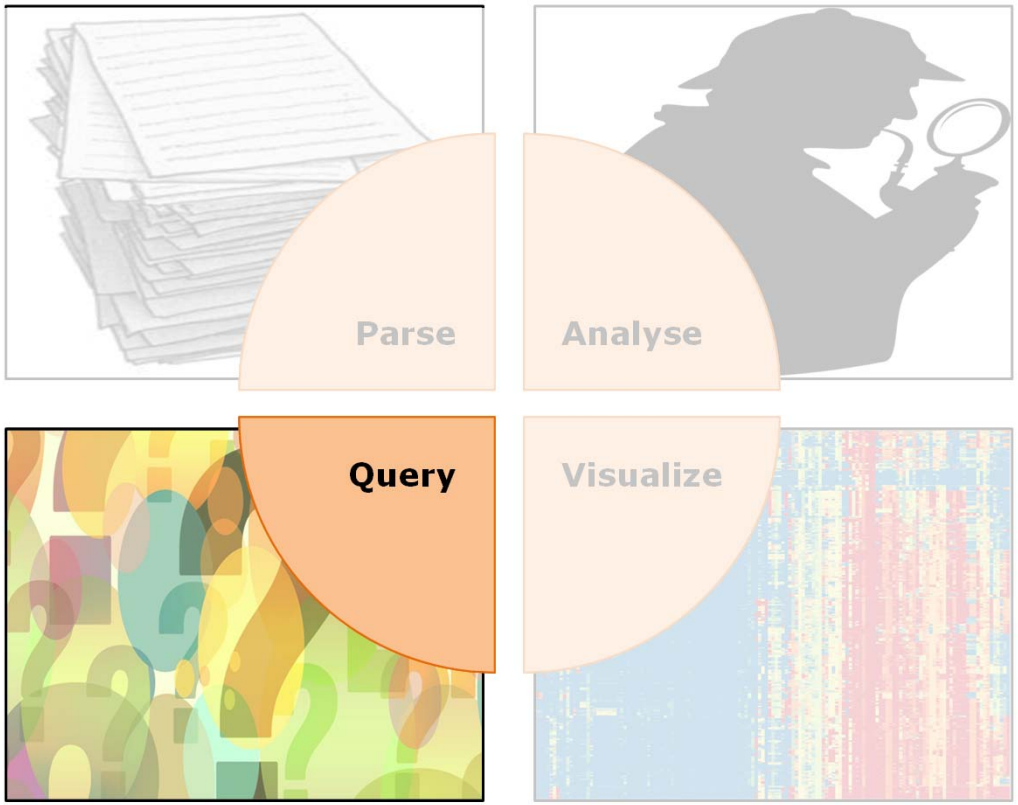

1. Genes to modules
2. Genes to genomes
3. Modules to genomes
4. Genomes to modules
5. Missing genes from module

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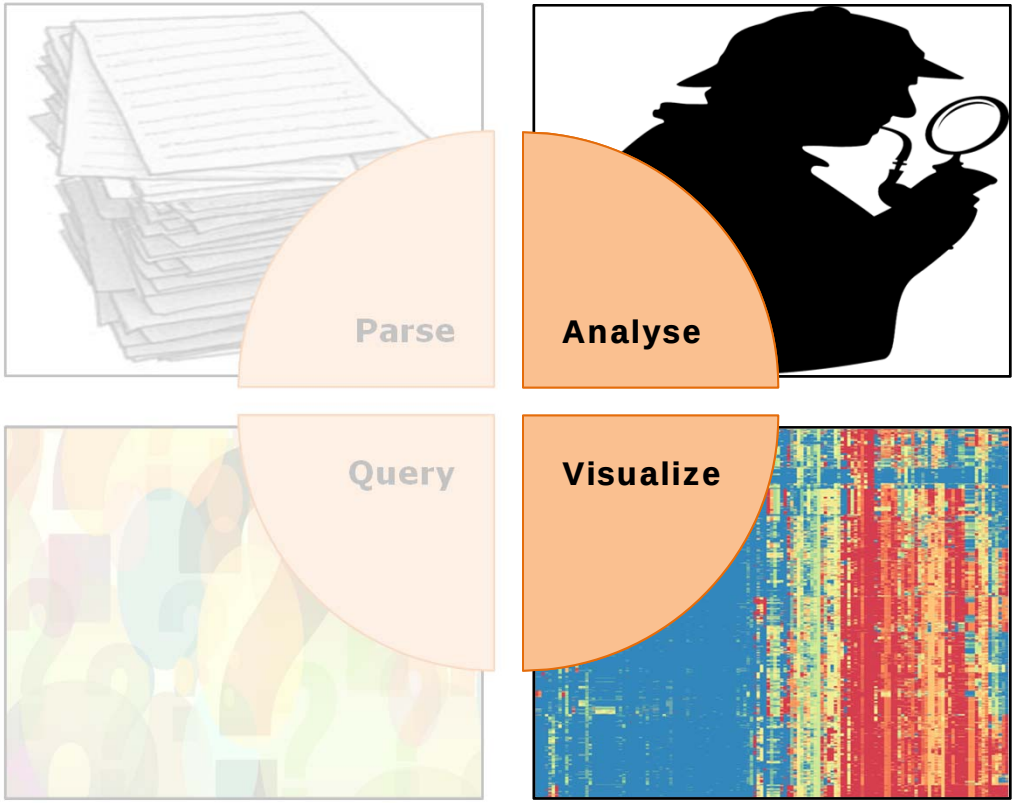
MetQy function families



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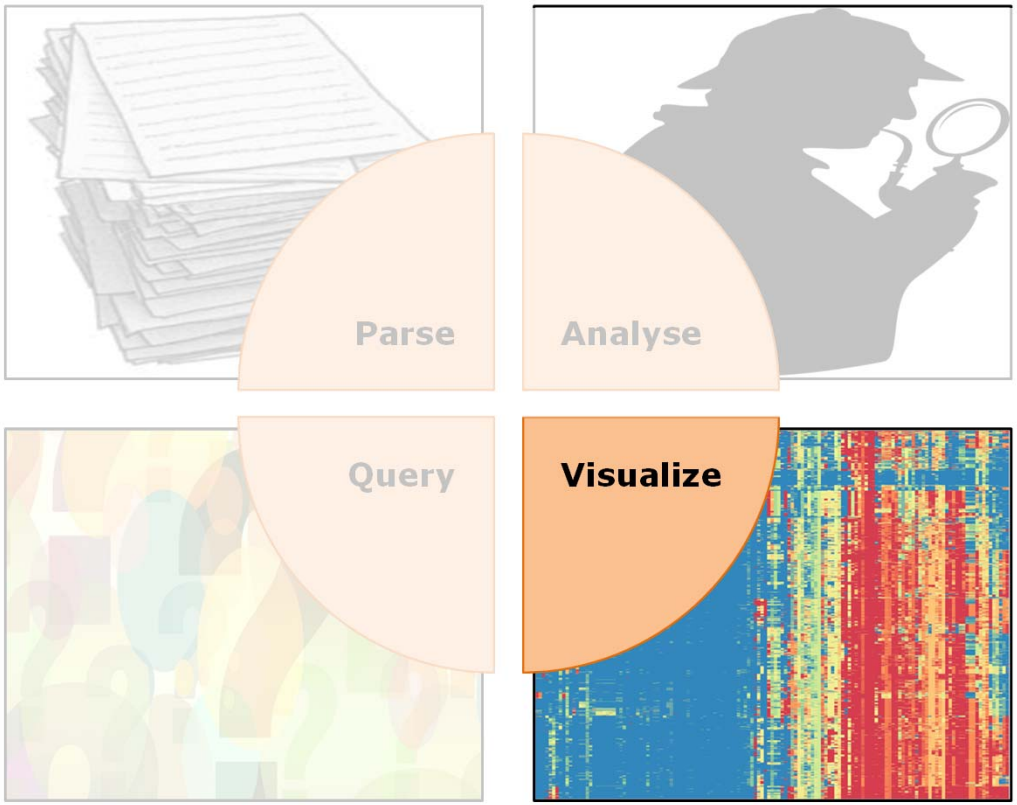

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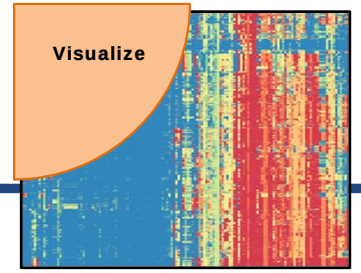
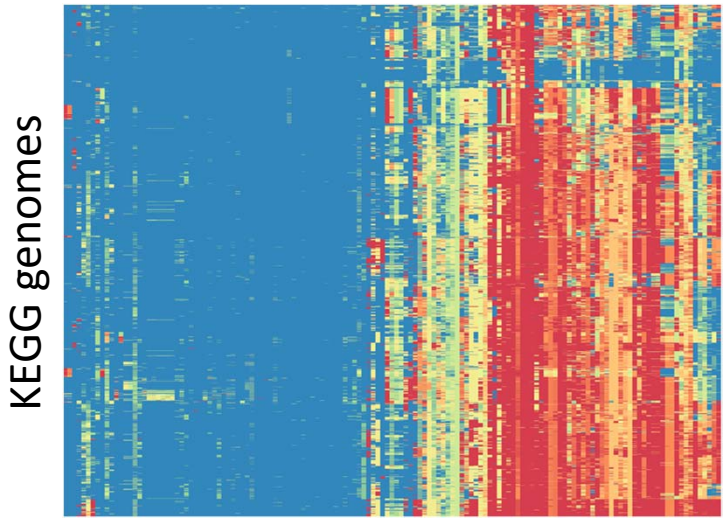
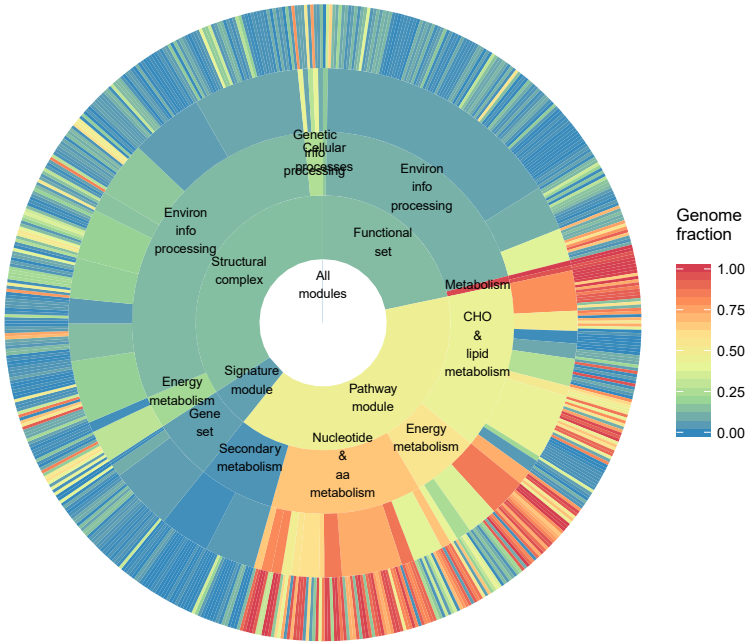
MetQy: visualize



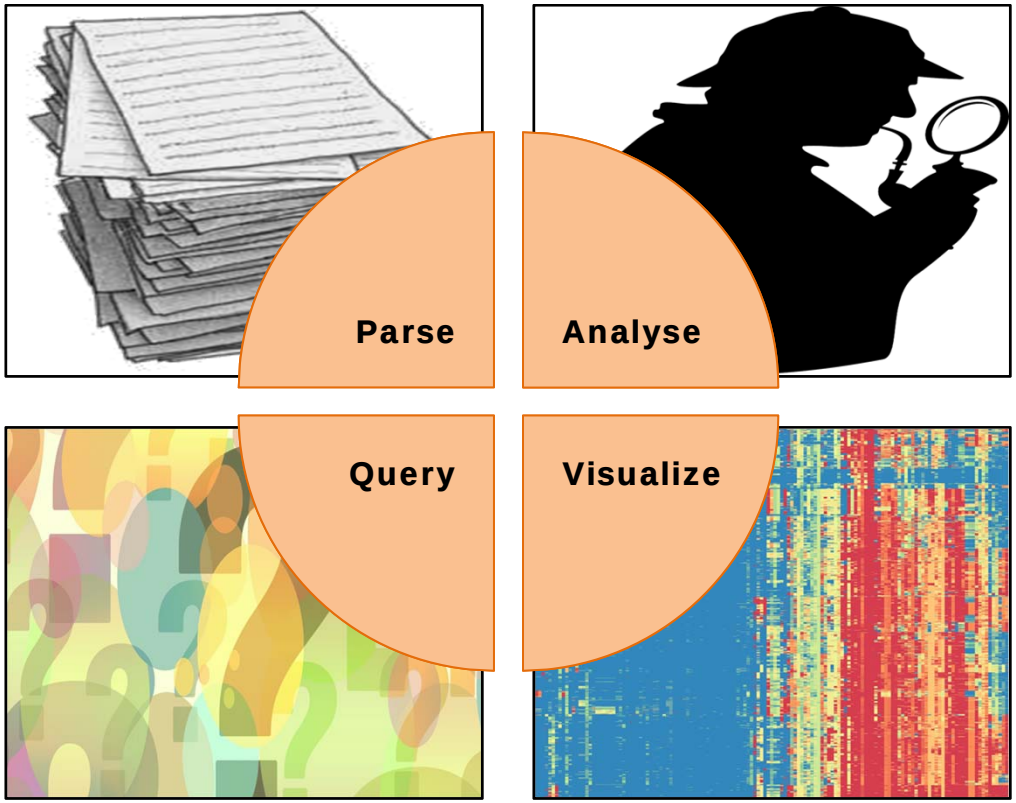




760+ modules, 5000+ KEGG genomes

- **Heatmap**: module completeness fraction (*mcf*)
- **Sunburst**: Fraction of genomes with *mcf* > 0.75

MetQy function families



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metabolic capabilities

Synthetic biology

identify genomes

metabolic engineering

synthetic community design

cti

mi

t p

metabolic models development

Systems biology

identifying carbon utilisation routes

identifying transporter modules

Thanks for your attention!

- Acknowledgements
  - Supervisors: Orkun Soyer & Marco Polin
  - Advisory panel: Kevin Purdy & Munehiro Asally
  - OSS Lab members
  - Funding: