TimiRGeN R package - novel tool for longitudinal microRNA-mRNA integration and analysis
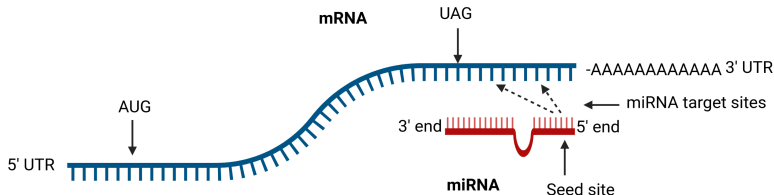
Bioc2021 Short Talk

Krutik Patel

PhD Student at Newcastle University

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Biological pre-amble: miRNAs are transcriptional regulators

miRNAs target **specific mRNAs** for negative regulations.

Multiple miRNAs can target a **single mRNA** and **multiple mRNAs** can targeted by a **single miRNA**.

miRNAs can circulate in **biofluids** so have potential as **non-invasive biomarkers**.

Longitudinal miRNA-mRNA expression datasets are becoming more popular

A **recent** pubmed search showed a **rise** of this type of dataset being generated.

- Longitudinal/ time series datasets provide **transient detail**
- Complementary miRNA data provides **regulatory information**
- Ongoing **reduction in the costs** of high-throughput technologies

Datasets likes these may become more popular in the **future!**

What software can deal with this type of data?

miRNA-mRNA integration and analysis tools

A tool search from Bioconductor, SourceForge, online sources and
locally installed software found **no current tool** which could
**integrate and analyse** longitudinal miRNA-mRNA datasets.

Tool name	Availability	Time	Funct analysis	Reduction	Updated
anamiR	Bioc	✗	✓:Kegg,React,+	✓	2018
DREM2	Install	✓	✓:GO	✗	2020
MAGIA2	Online	✗	✓:DAVID	✓	2012
miARMa-seq	Install	✓	✓:GO,Kegg	✗	2019
miRComb	SF	✗	✓:GO,Kegg	✓	2020
miRIntegrator	Bioc	✗	✓:Kegg,React	✓	2016
miRNet	Online	✗	✓:GO,Kegg	✗	2021
miRTarVis+	Online	✗	✗	✓	2020
Sigterms	SF	✗	✓:GO	✓	2009
SpidermiR	Bioc	✗	✗	✓	2020
ToppMiR	Online	✗	✓:GO	✓	2021

PhD aim - Create a novel tool to analyse this type datasets

Several characteristics are needed for it to be of use to the **non-coding RNA research community**.

- Work **after DE** analysis to be universal in use.

- Compatible with **RNAseq and microarray** experiments.

- Cater to a **range** of popular **organisms**.

- Analyse multiomic data **together and separately**.

- **Network Generation**.

- Contain **metrics** to measure individual **miRNA-mRNA pairs**.

- Be applicable after **any longitudinal based DE**.

TimiRGeN (**T**ime **i**ncorporated **miR**-mRNA **Ge**neration of **N**etworks) R/Bioconductor Package
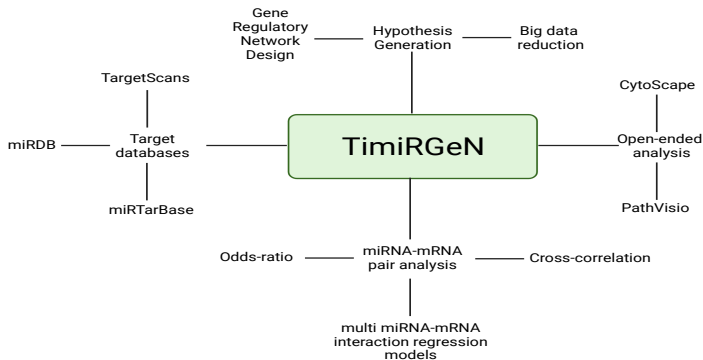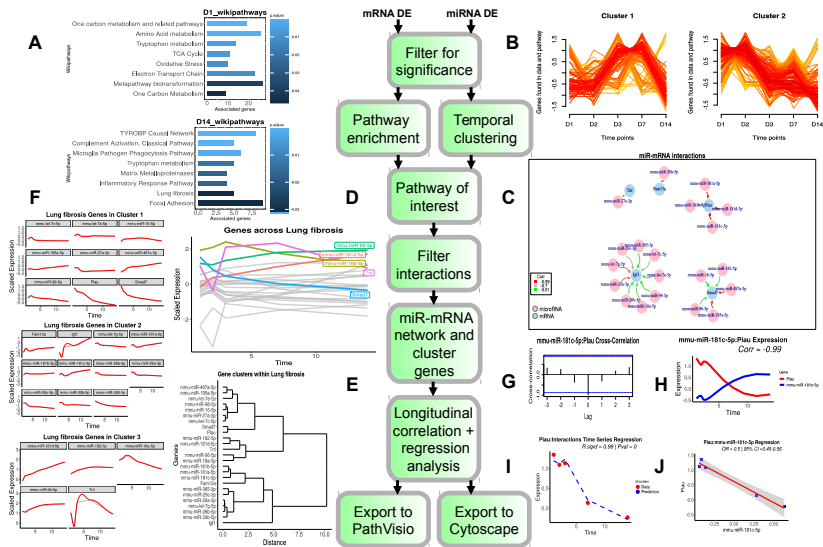
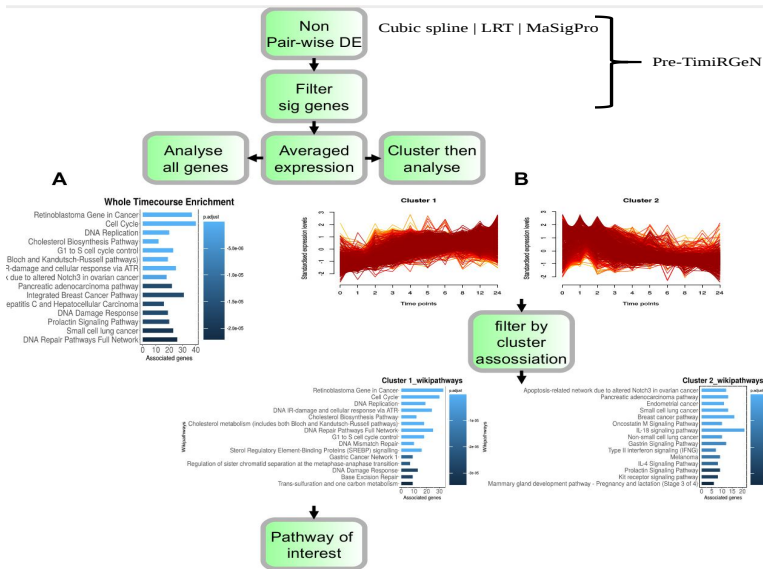K Patel, S Chandrasegaran, I M Clark, C J Proctor, D A Young, D P Shanley, TimiRGeN:

R/Bioconductor package for time series microRNA-mRNA integration and analysis, Bioinformatics,
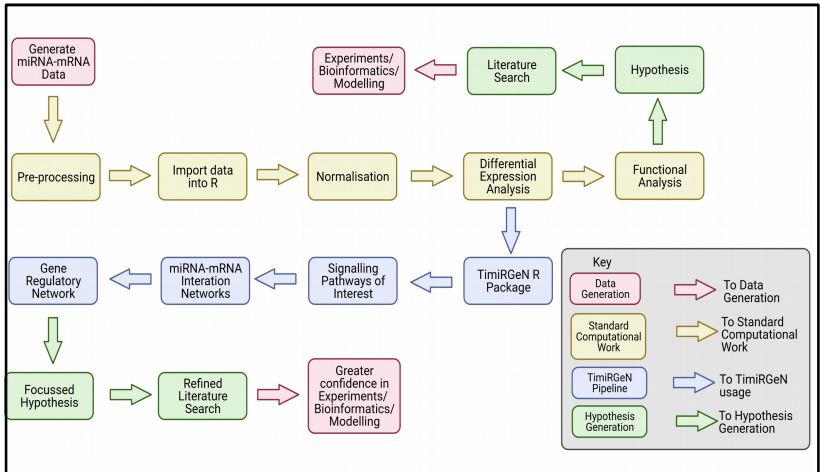
2021.

Example pipeline: Pairwise DE - Kidney Injury dataset

Example pipeline: non-Pairwise DE - Breast cancer dataset

TimiRGeN Aim - to generate hypothesis from large complex datasets

Thanks for listening

Thanks to:

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