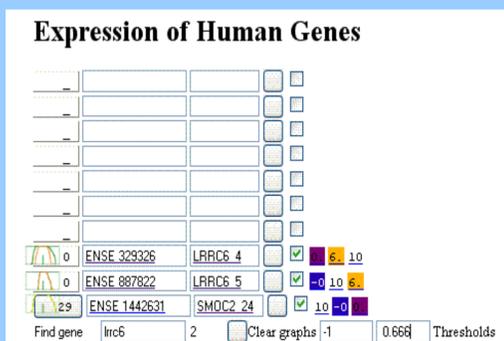
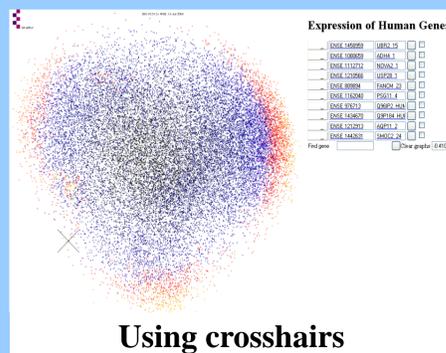


RNAnet is a Firefox based web tool to explore human Affymetrix mRNA data in GEO using Ensembl gene and exon definitions.

RNAnet is able to:

- Get correlation heatmaps and scatter plots for all probes in a probeset, all probes uniquely mapped to an exon, an arbitrary (user defined) list of probes, and all exons.
- Web based detection of spatial flaws and one CEL normalisation.



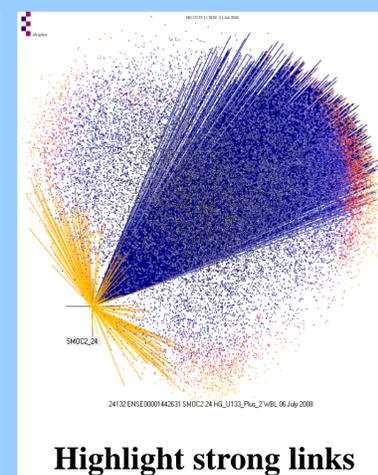
Materials

- So far, RNAnet uses all the HG-U133 2+ Genechips.
- Best probe chosen (no G-spots!). Covers at least one exon from 14,288 Ensembl genes.
- All exon correlations calculated across 2,757 arrays (290 million correlations).

Methods

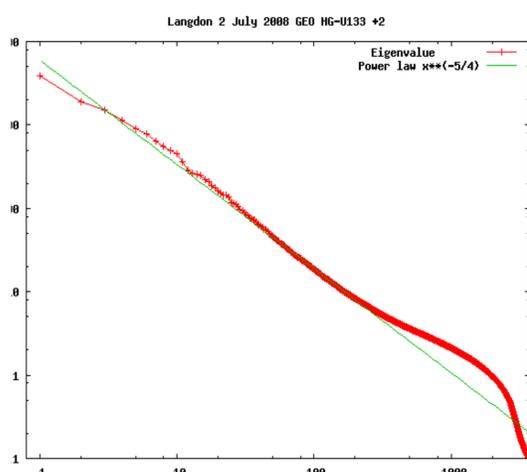
- Static method: eigen analyse (PCA) group exons with similar interactions.
- Interactive method: user selects genes or exons of interest.
- Combined method: PCA map guides user as to what might be interesting.

Correlation of Expression of Human Genes in GEO



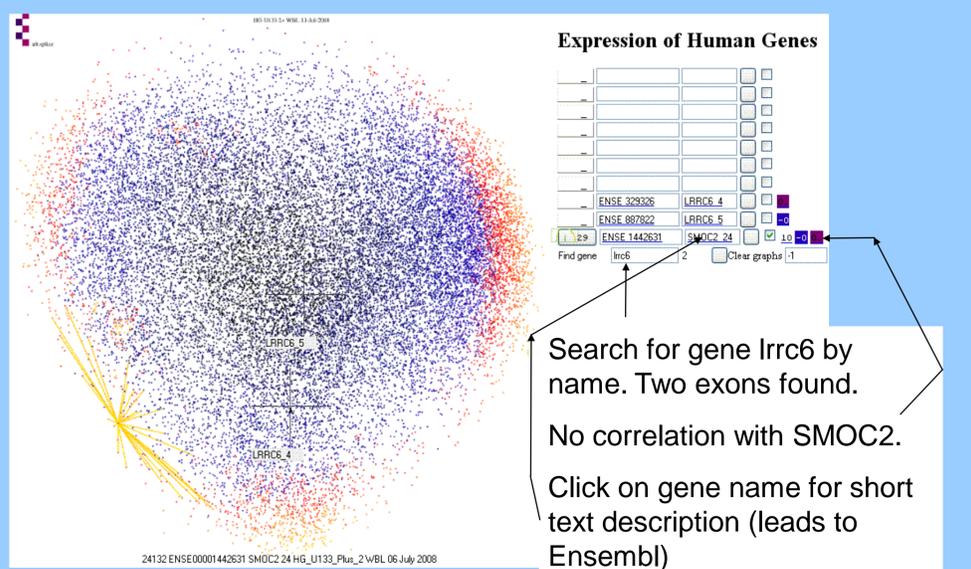
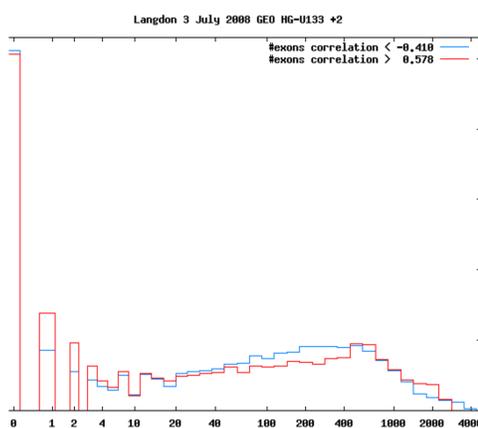
Eigen analysis of Human Exon Correlations

- Correlation of 24,132 24,132 exons as square symmetric matrix.
- Eigen values fall rapidly. Power law typical of “small world” networks. Only first 500 needed.
- Most eigen vectors short, <8,000.
- Eigen analysis can approximate 300 million correlations with 400thousand numbers.



Systems Biology “Small World” Network

- The strong links (< -0.410 or > 0.578) form a sparse network, which nonetheless connects nearly all exons.
- Average number of strong links is 32 (48).
- 2,920 of exons have no strong links.
- 350 exons are highly correlated with $>2,000$ others.



Conclusions

- Correlations between human exons are highly non-random. The network formed by pairs of strongly correlated exons is a “small world”.
- RNAnet provides an interactive tool to explore RNA expression (protein gene and non-protein coding) of thousands of published 3' GeneChips covering virtually all medically interesting human tissues.
- Future: extend to other arrays, other organisms.

Availability

<http://bioinformatics.essex.ac.uk/users/wlangdon/rnanet/index.html>

Acknowledges

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