Reanalysis of mouse-rat comparative gene expression data towards batch effects

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Original papers

Comparison of the transcriptional landscapes between human and mouse tissues

Shin Lin[a,b,1], Yiing Lin[c,1], Joseph R. Nery[d], Mark A. Urich[d], Alessandra Breschi[e,f], Carrie A. Davis[g], Alexander Dobin[g], Christopher Zaleski[g], Michael A. Beer[h], William C. Chapman[c], Thomas R. Gingeras[g,i], Joseph R. Ecker[d,j,2], and Michael P. Snyder[a,2]

(Lin et al., 2014)

A reanalysis of mouse ENCODE comparative gene expression data [version 1; peer review: 3 approved, 1 approved with reservations]

Yoav Gilad, Orna Mizrahi-Man

(Gilad, Mizrahi-Man, 2015)

New dataset

Data Descriptor: An RNA-Seq atlas of gene expression in mouse and rat normal tissues

Julia F. Söllner[1,2], German Leparc[1], Tobias Hildebrandt[1], Holger Klein[1], Leo Thomas[3], Elia Stupka[1] & Eric Simon[1]

(Söllner et al, 2017)

Study design of Söllner et al.

Batch number

#1	#2	#3	#4	#5	#6	#7
Kidneys	**Brain**	*Colon*	*Brain*	*Colon*	*Brain*	*Brain*
Quadriceps	**Esophagus**	*Duodenum*	*Esophagus*	*Duodenum*	*Duodenum*	*Colon*
	Heart	*Ileum*	*Heart*	*Heart*	*Esophagus*	*Esophagus*
	Thymus	*Jejunum*	*Liver*	*Ileum*	*Ileum*	*Heart*
		Kidney	*Pancreas*	*Jejunum*	*Jejunum*	*Kidney*
		Liver	*Quadriceps*	*Kidney*	*Liver*	*Quadriceps*
		Pancreas	*Stomach*	*Quadriceps*	*Pancreas*	*Thymus*
		Stomach	*Thymus*	*Thymus*	*Stomach*	**Brain**
			Colon	**Brain**	**Colon**	**Colon**
			Duodenum	**Duodenum**	**Esophagus**	**Duodenum**
			Ileum	**Esophagus**	**Heart**	**Ileum**
			Jejunum	**Heart**	**Ileum**	**Jejunum**
			Kidneys	**Liver**	**Jejunum**	**Liver**
			Liver	**Pancreas**	**Kidneys**	**Pancreas**
			Quadriceps	**Stomach**	**Quadriceps**	**Pancreas**
Rat			**Stomach**	**Thymus**	**Thymus**	**Stomach**
Mouse						

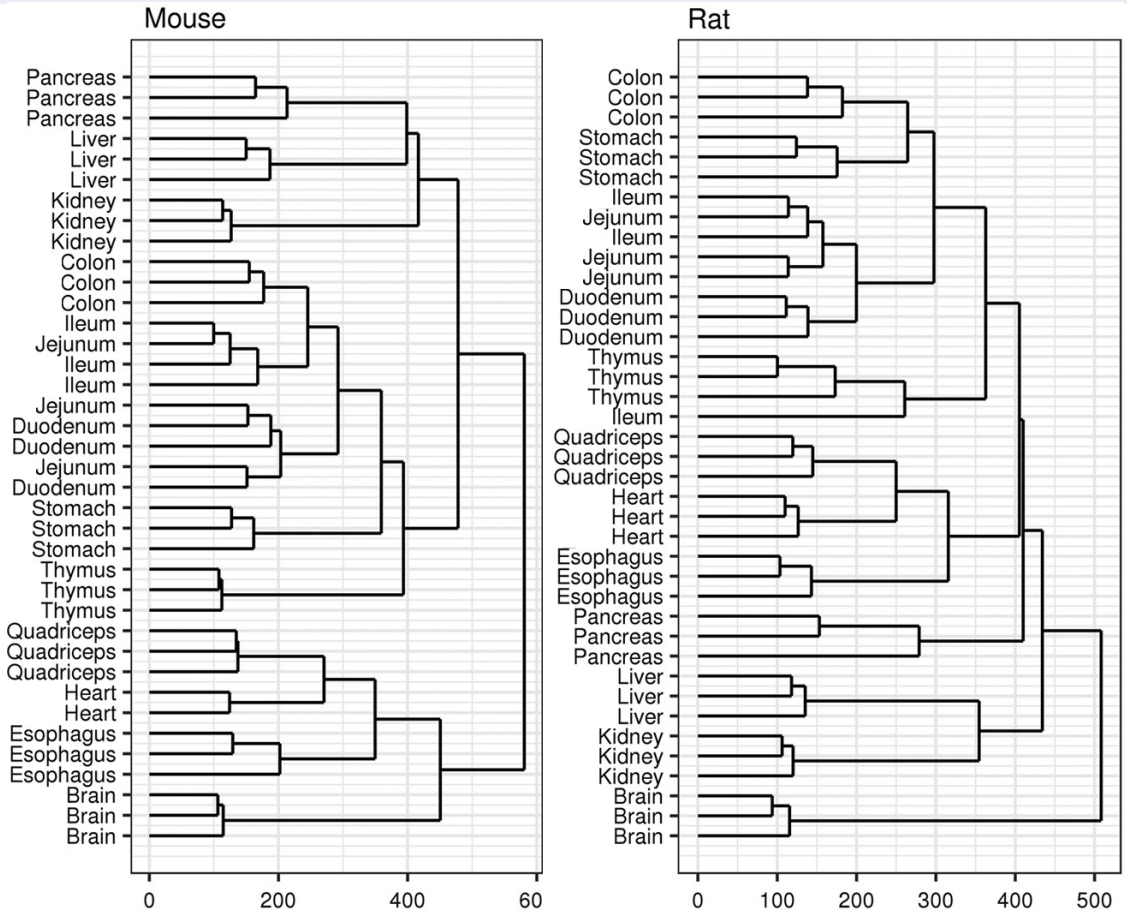
Study design of Lin et al.

Batch number

#1	#2	#3	#4	#5
Heart	**Adipose**	*Adipose*	*Heart*	**Brain**
Kidney	**Adrenal**	*Adrenal*	*Kidney*	**Pancreas**
Liver	**Sigmoid colon**	*Sigmoid colon*	*Liver*	*Brain*
Small bowel	**Lung**	*Lung*	*Small bowel*	*Spleen*
Spleen	**Ovary**	*Ovary*	*Testis*	
Testis		*Pancreas*		

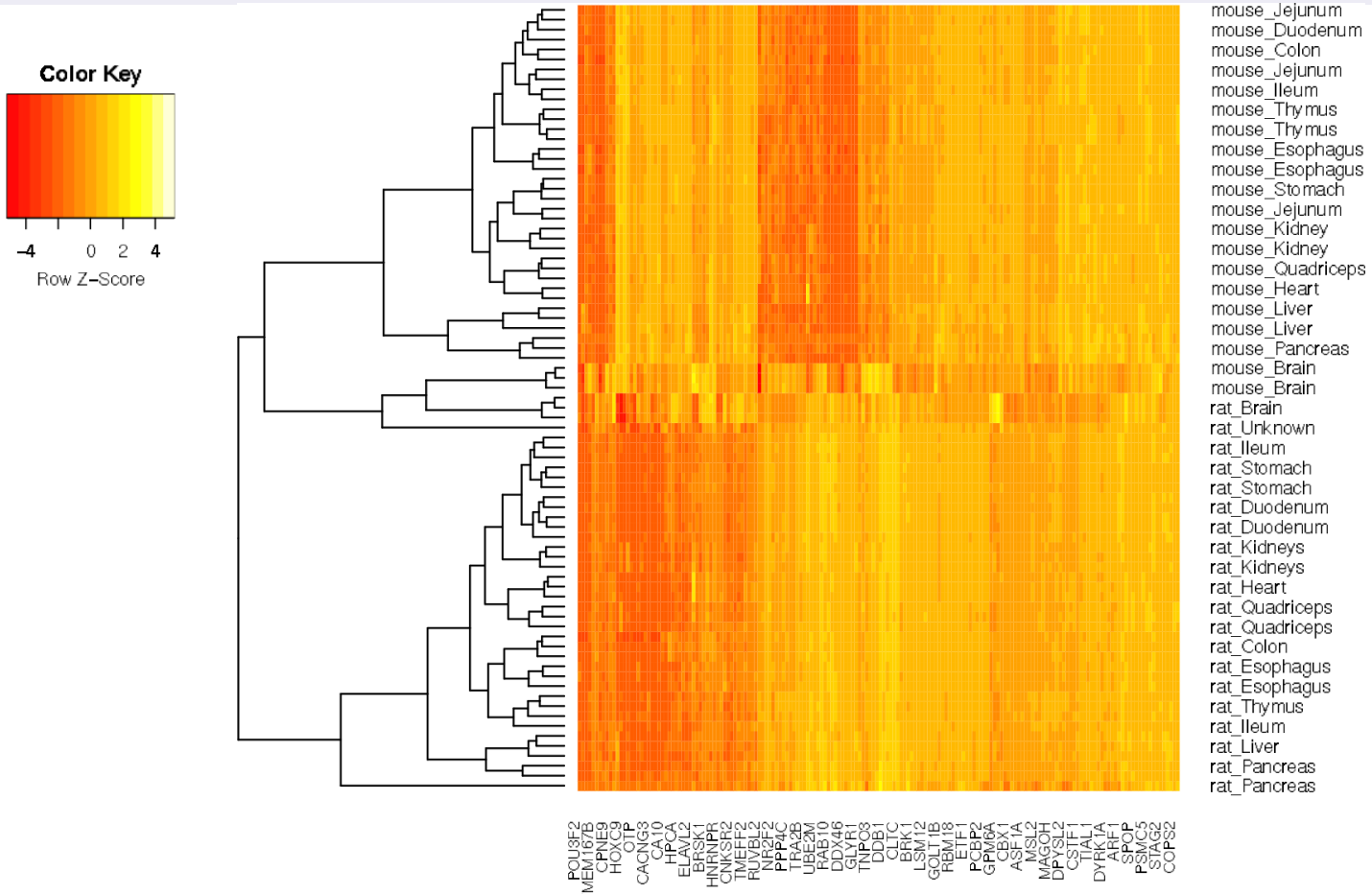
Human
Mouse

Söllner et al.'s results



Independent hierarchical clustering of mouse and rat samples.

Söllner et al.'s results



Joint hierarchical clustering of mouse and rat samples (top ~150 highest-conserved genes).

Aims

- Repeat Gilad and Mizrahi-Man's reanalysis of Lin et al.'s dataset on Söllner et al's dataset:
  - Cluster and visualize data before reanalysis
  - Apply correction for batch effects with SVA
  - Cluster and visualize data after reanalysis

- Attempt to deconfirm intra-over-inter clustering as artifact?

References

- Gilad Y, Mizrahi-Man O,
  A reanalysis of mouse ENCODE comparative gene expression data.
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  DOI: 10.12688/f1000research.6536.1
- Lin S, Lin Y, Nery JR et al.,
  Comparison of the transcriptional landscapes between human and mouse tissues.
  Proc Natl Acad Sci U S A **111**(48), 2014.
  DOI: 10.1073/pnas.1413624111
- Söllner J, Leparc G, Hildebrandt T et al.,
  An RNA-Seq atlas of gene expression in mouse and rat normal tissues.
  Sci Data **4**, 2017.
  DOI: 10.1038/sdata.2017.185