

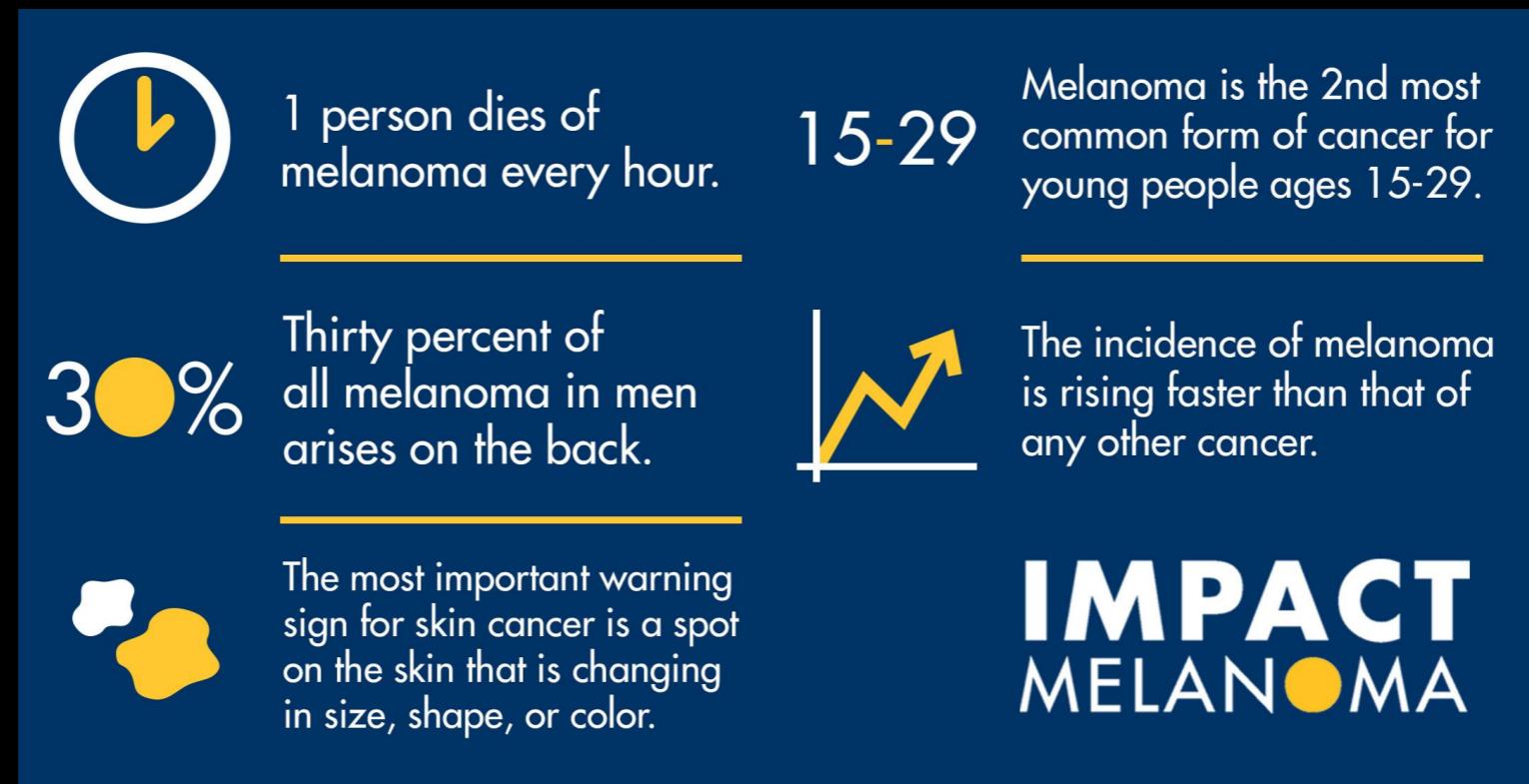
Exploring Melanoma Single Cell RNA seq. Data Set to Investigate Iron Metabolism in Different Cases of Melanoma

What is melanoma?

**Cancerous growths on skin; caused by mutations
as a result of un-repaired damage to DNA of skin
cells by UV radiation**

“Melanoma.” *Skin Cancer Foundation*, The Skin
Cancer Foundation, www.skincancer.org/skin-cancer-information/melanoma.

Melanoma General Statistics

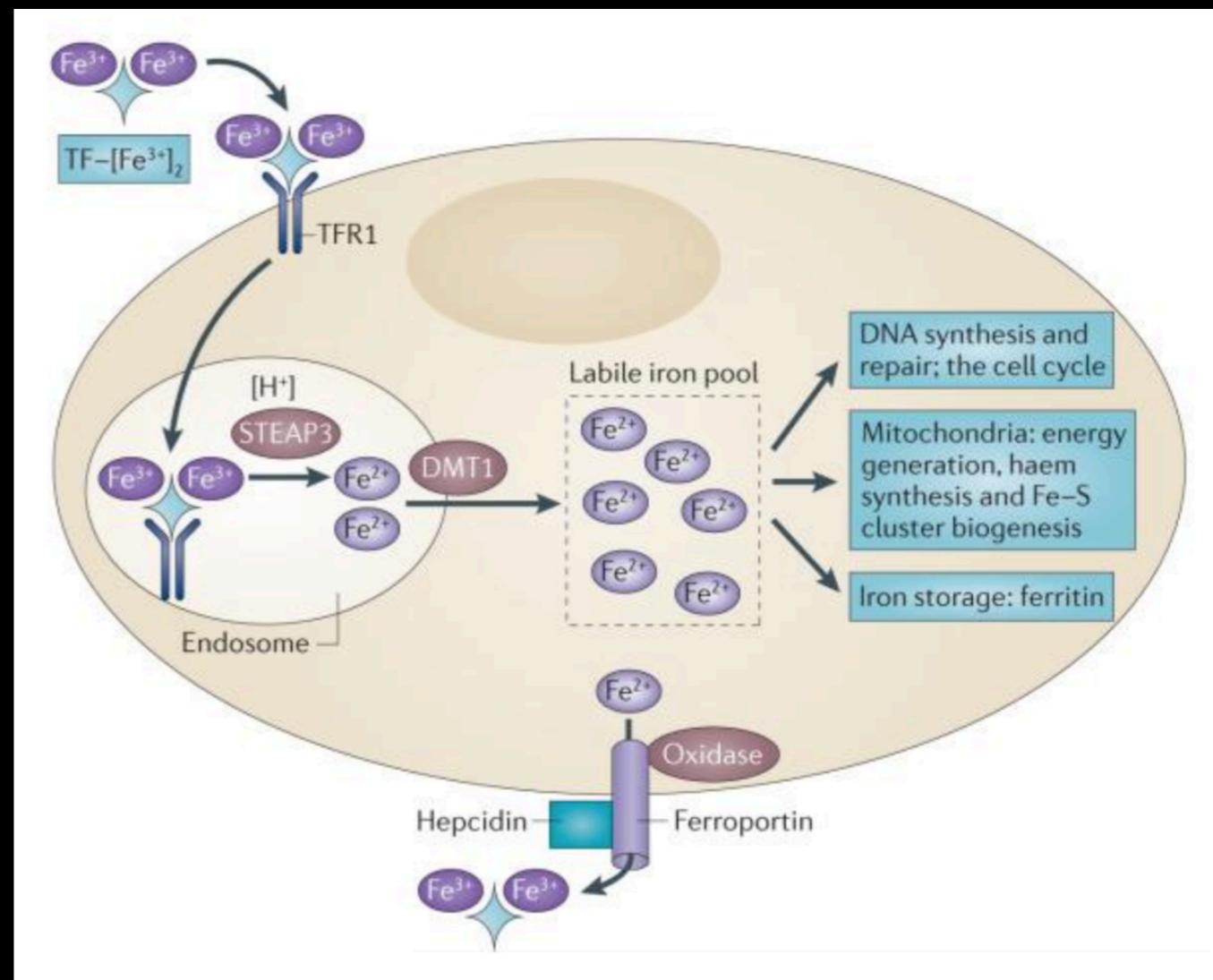


Incidence of melanoma has doubled over the past 3 decades

Use of tanning beds increases risk of melanoma by 75%

Why Look at Iron Metabolism?

- Maintains homeostasis in body
- Iron in human body = necessary & potentially toxic
- Iron has role in tumor microenvironment & metastasis (Torti, Torti)
- Iron pathways are perturbed in cancer => reprogramming of iron metabolism (Torti, Torti)

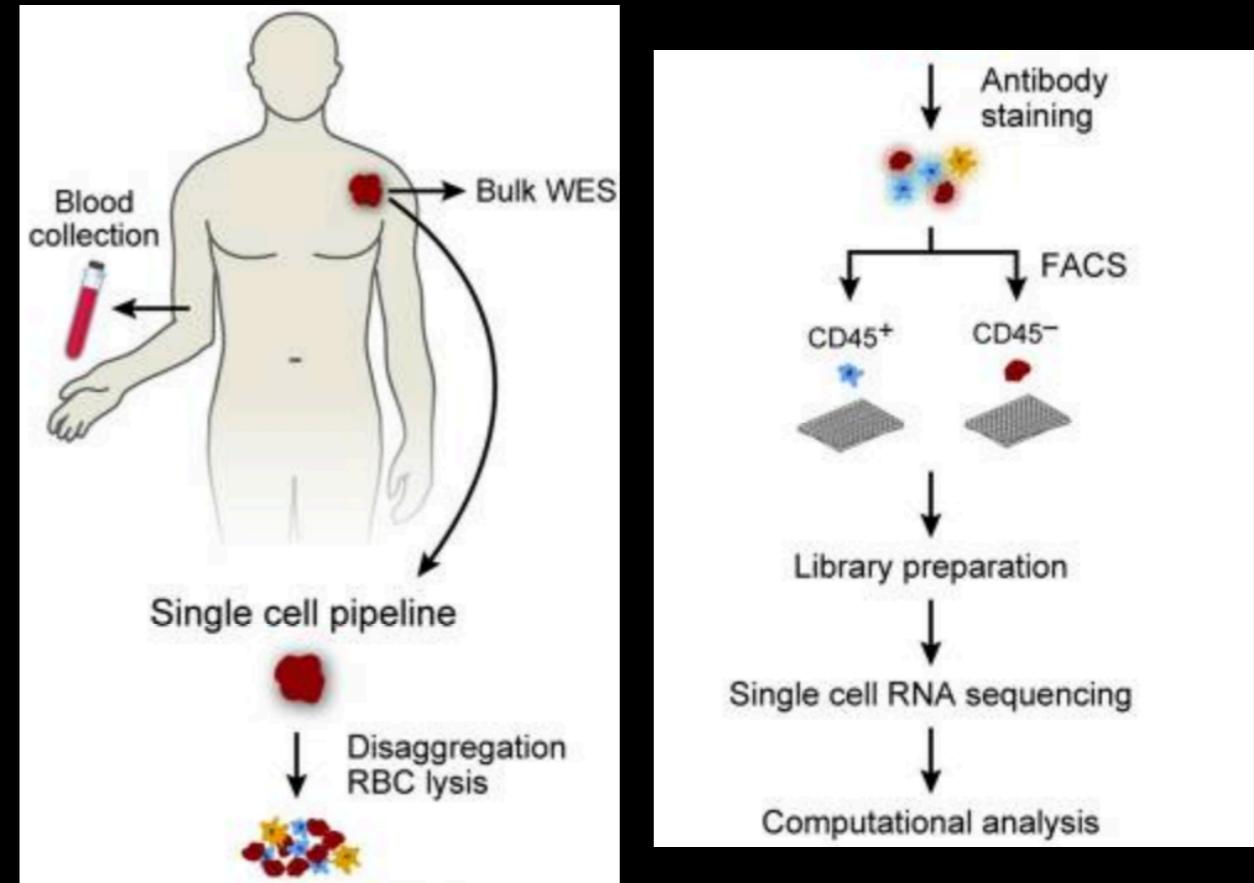


Torti, Suzy V., and Frank M. Torti. "Iron and Cancer: More Ore to Be Mined." *Nature Reviews Cancer*, vol. 13, no. 5, 2013, pp. 342–355., doi:10.1038/nrc3495.

The Data Set

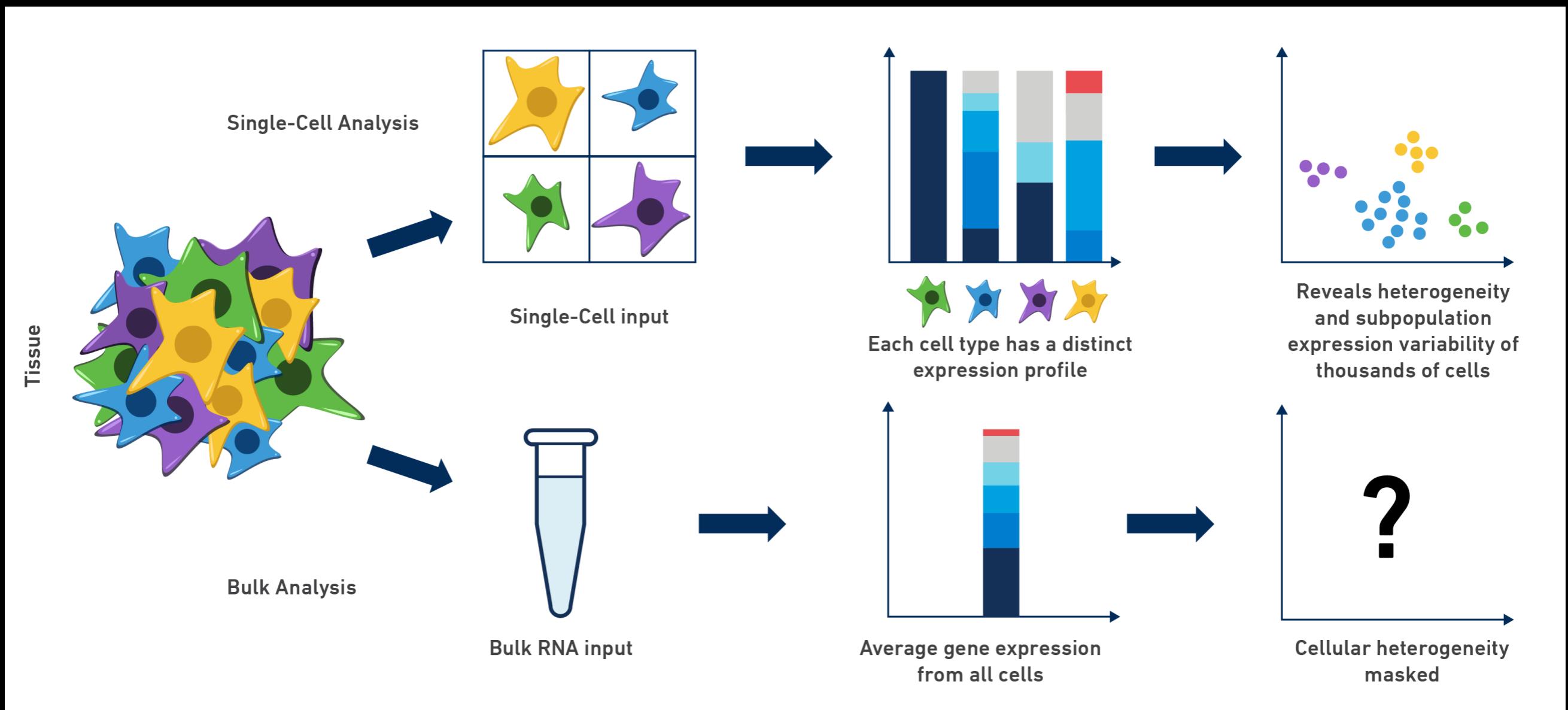
Dissecting the multicellular ecosystem of metastatic melanoma by single-cell RNA-seq

- ★ 15 different cases of melanoma
- ★ Over 20,000 different genes
- ★ Cell types:
 - ★ Malignant
 - ★ Non-Malignant
 - ★ T cells, B cells, Macrophages, etc.



Tirosh, et al. “Dissecting the Multicellular Ecosystem of Metastatic Melanoma by Single-Cell RNA-Seq.” *Science*, vol. 352, no. 6282, 2016, pp. 189–196., doi: 10.1126/science.aad0501.

What does Single-cell RNA seq. tell you?



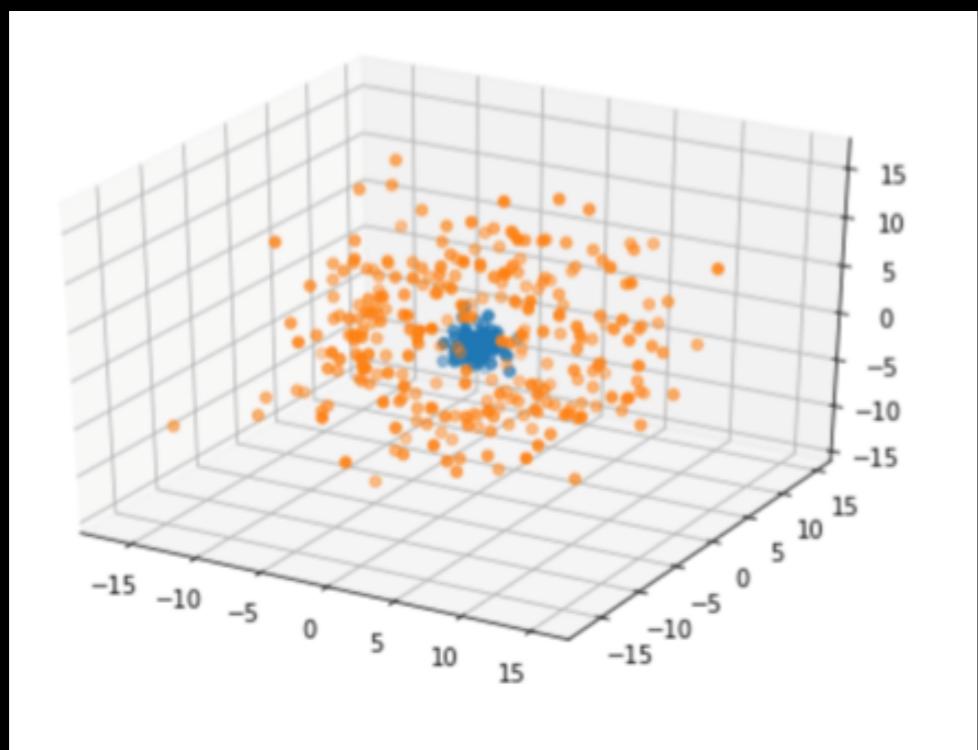
Tirosh, et al. “Dissecting the Multicellular Ecosystem of Metastatic Melanoma by Single-Cell RNA-Seq.” *Science*, vol. 352, no. 6282, 2016, pp. 189–196., doi:10.1126/science.aad0501.

What is t-SNE?

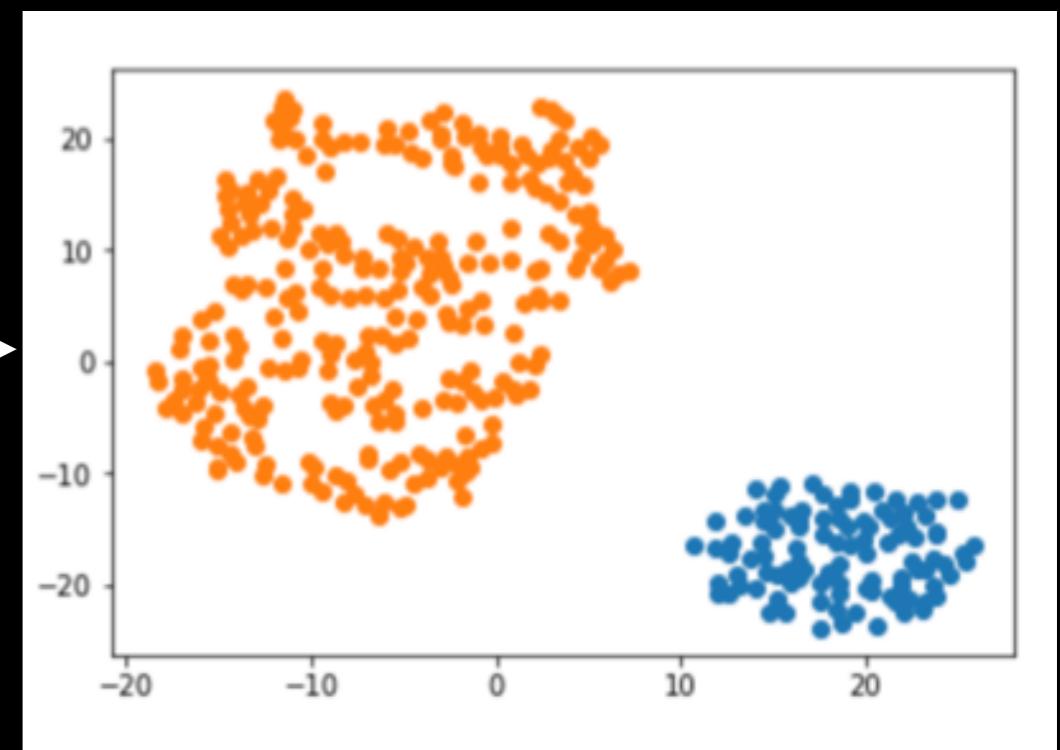
t-SNE takes high-dimensional data and reduces it to a low-dimensional graph that retains most of the original information

StatQuest with Josh Starmer. “StatQuest: t-SNE, Clearly Explained.” *YouTube*, YouTube, 18 Sept. 2017, www.youtube.com/watch?v=NEaUSP4YerM.

Sample dataset

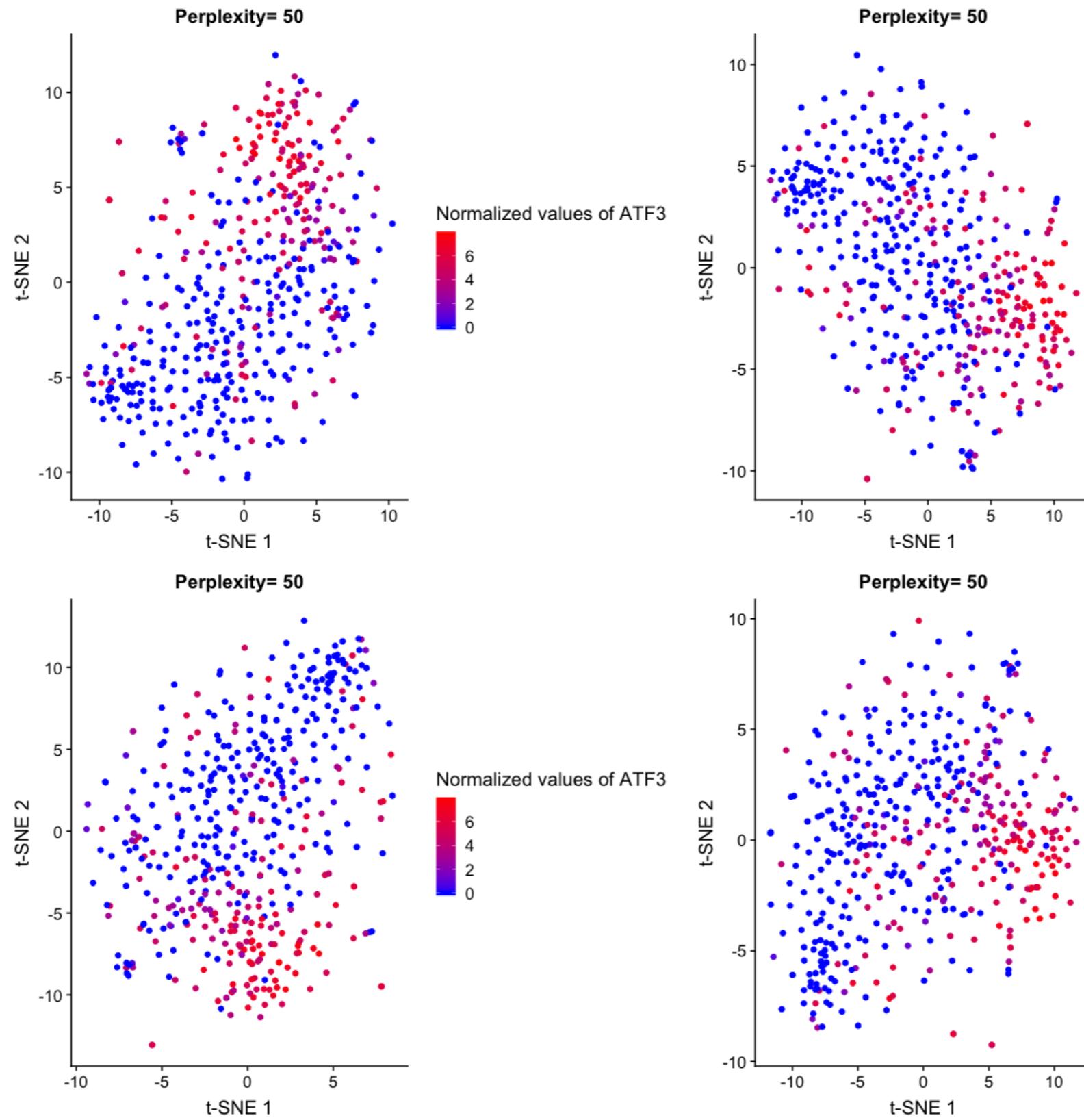


t-SNE



Keitakurita, “Paper Dissected: ‘Visualizing Data Using t-SNE’ Explained.”
Machine Learning Explained, 15 Sept. 2018, mlexplained.com/2018/09/14/paper-dissected-visualizing-data-using-t-sne-explained/

Seeds

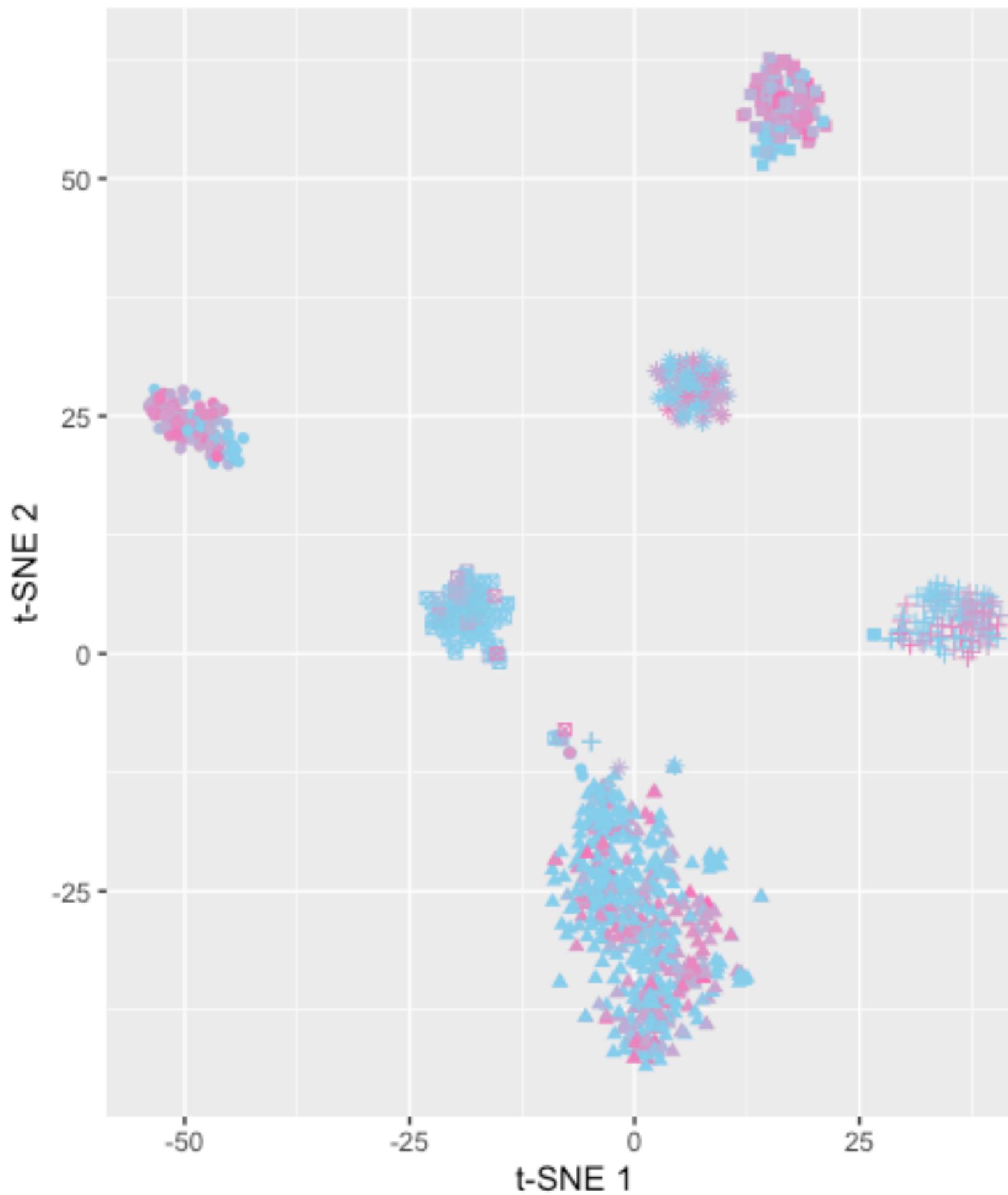


ATF3: induced in a variety of signals, including many of those encountered by cancer cells, and is involved in the process of cellular stress response

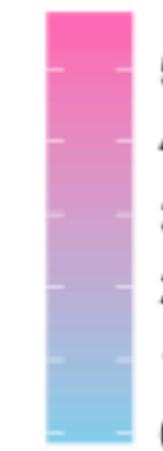
"ATF3." Genecards.org,
www.genecards.org/cgi-bin/carddisp.pl?gene=ATF3.

Perplexity= 50

t-SNE plot



Normalized values of TFRC



tumor_orig

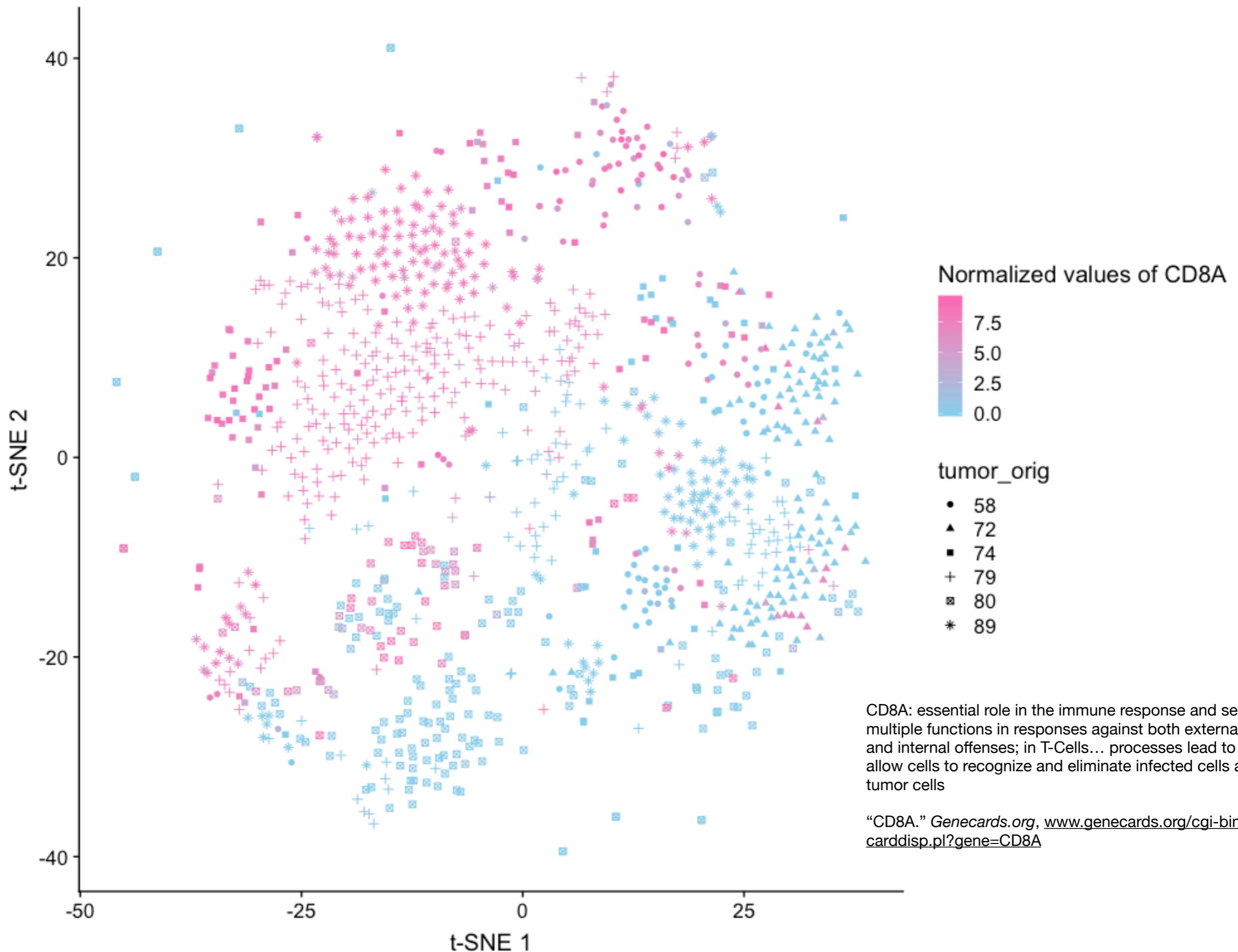
●	78
▲	79
■	80
+	81
□	88
*	89

TFRC: helps in iron uptake. High concentration in cancerous cells

"TFRC." Genecards.org,
www.genecards.org/cgi-bin/
carddisp.pl?
gene=TFRC&keywords=tfc.

t-SNE plot

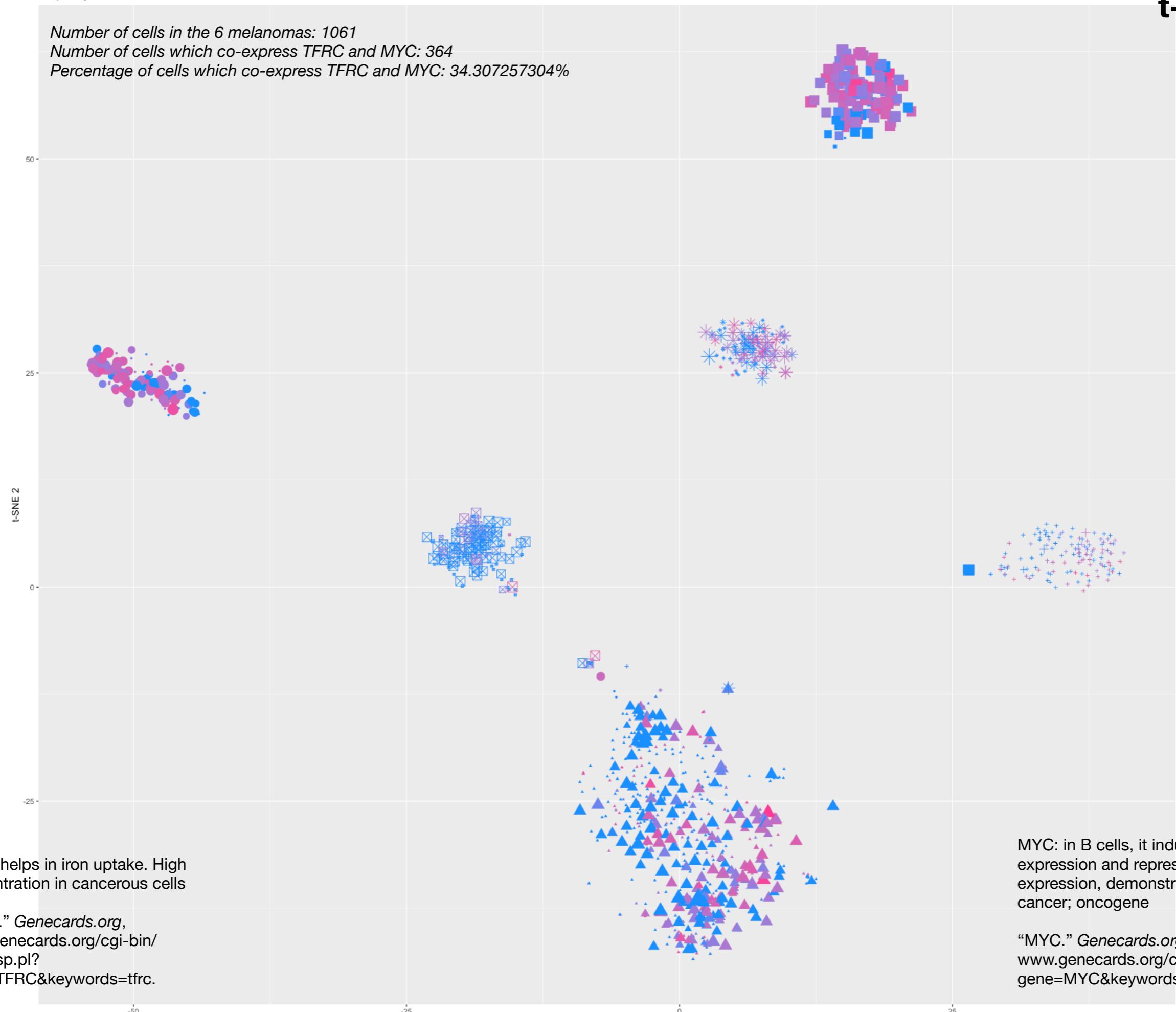
Perplexity= 50



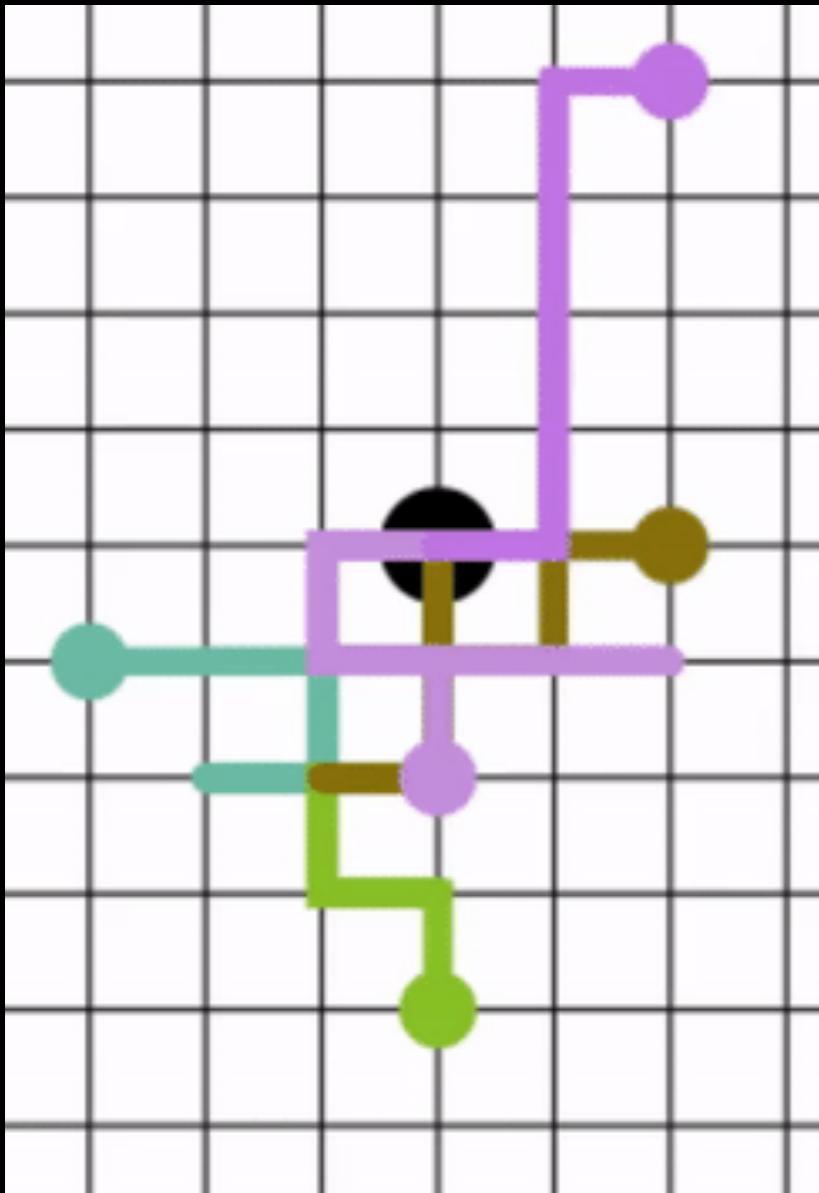
Perplexity= 50

t-SNE plot

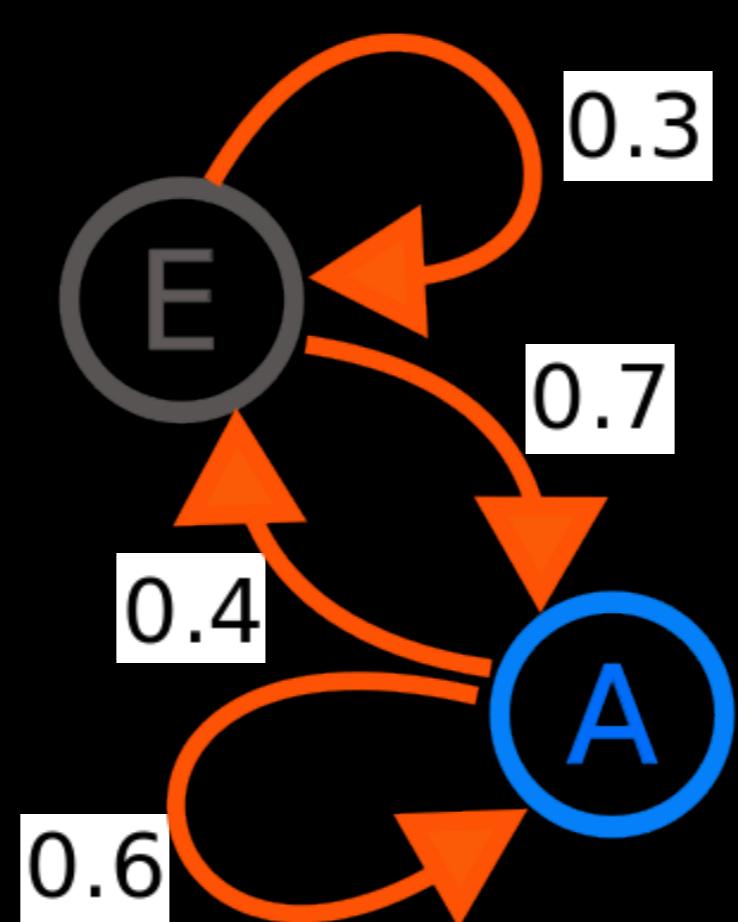
Number of cells in the 6 melanomas: 1061
Number of cells which co-express TFRC and MYC: 364
Percentage of cells which co-express TFRC and MYC: 34.307257304%



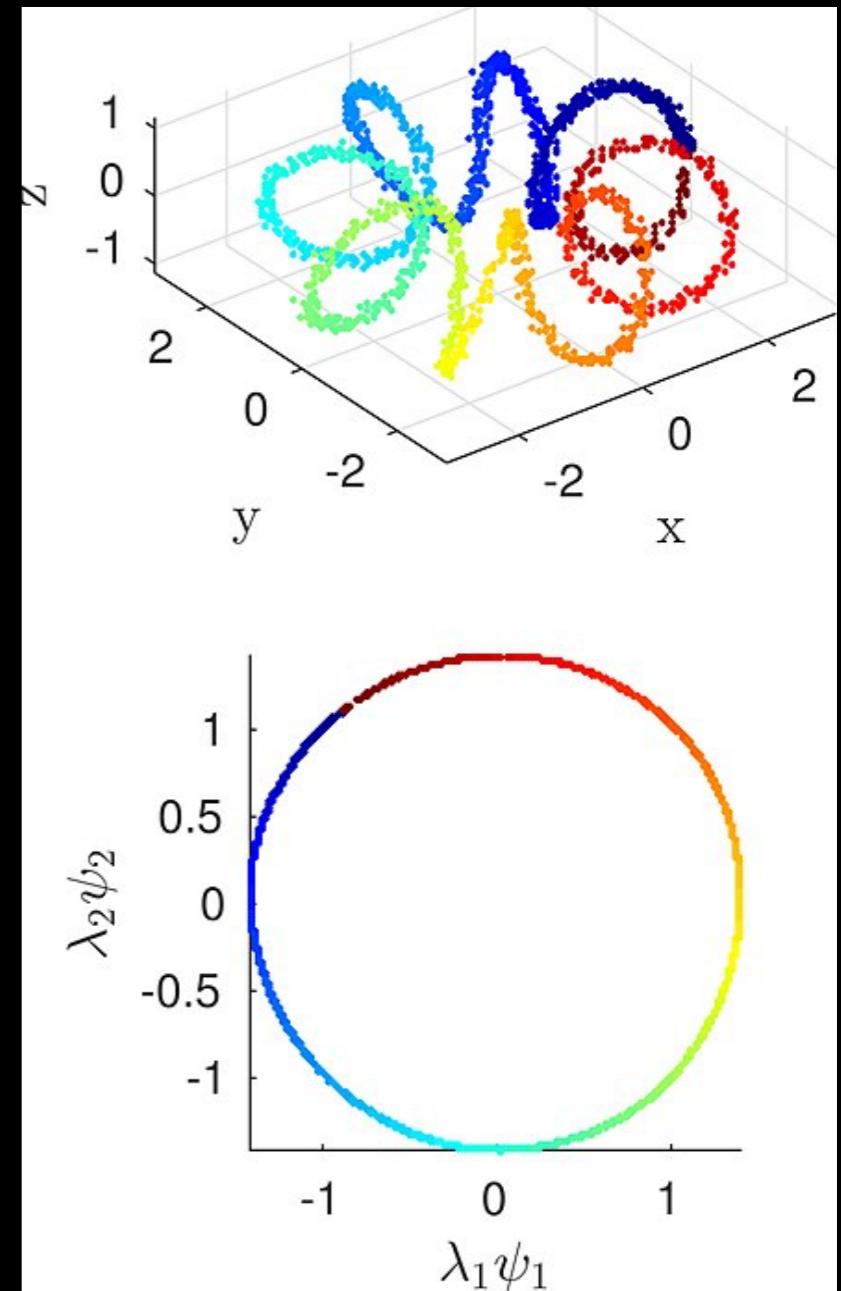
What are Diffusion Maps?



“Random Walk.” *Wikipedia*,
Wikimedia Foundation, 26 July
2019, en.wikipedia.org/wiki/Random_walk.

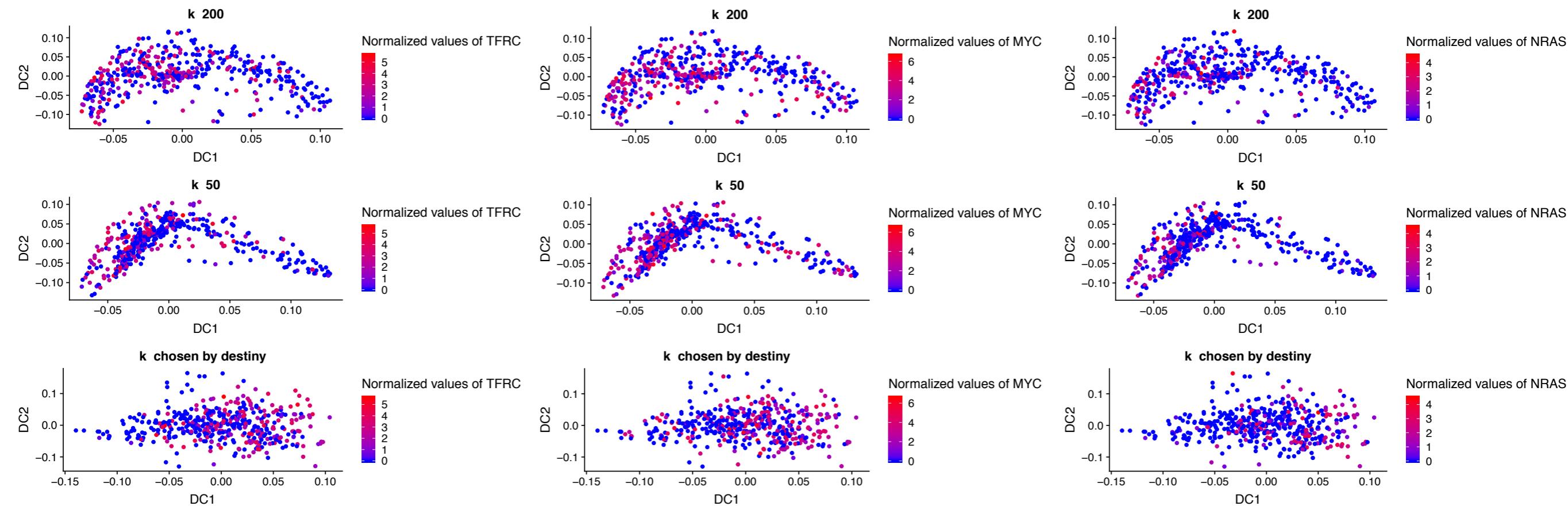


“Markov Chain.” *Wikipedia*,
Wikimedia Foundation, 26 July
2019, en.wikipedia.org/wiki/Markov_chain.



“Diffusion Map.” *Wikipedia*,
Wikimedia Foundation, 24
May 2019, en.wikipedia.org/wiki/Diffusion_map.

Diffusion maps



TFRC: helps in iron uptake.
High concentration in
cancerous cells

“TFRC.” Genecards.org,
www.genecards.org/cgi-bin/carddisp.pl?gene=TFRC&keywords=tfrc.

MYC: in B cells, it induces IRP2 expression and represses ferritin expression, demonstrated in colon cancer; oncogene

“MYC.” Genecards.org,
www.genecards.org/cgi-bin/carddisp.pl?gene=MYC&keywords=myc.

NRAS: encodes a membrane protein that shuttles between the Golgi apparatus and the plasma membrane; Mutations in this gene have been associated with conditions including somatic rectal cancer and follicular thyroid cancer; oncogene

“NRAS.” Genecards.org,
www.genecards.org/cgi-bin/carddisp.pl?gene=NRAS.

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Avon High School

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