

2025-05-29-spatial-implants

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1 Experiment

Quantifying how spatial distance from implant site affects the magnitude of significantly up-regulated genes in acutely stimulated brain.

2 Hypothesis

For gene(sets) up-regulated in the acutely stimulated sample (compared to control), expression will decrease as function of distance from the implant.

3 Methods

Linear regression and a one-sided hypothesis test indicated whether up-regulation decreased as distance from implant increased. The alternative hypothesis was that the regression slope was less than 0: `scipy.stats.linregress(x,y,alternative='less')`.

4 Key takeaways

- Many gene(sets) support the experimental hypothesis that **up-regulation decreases as distance increases from the implant**.
- Ccl3 2, Ccl4 3, inflammatory response geneset 1, MAPK cascade geneset 4, and many others are **significantly alternative under the null distribution** ($p\text{-value} < 0.05$).
- **A negative example is the synaptic plasticity geneset.** Where, the distance slope is not significantly less than 0 ($p\text{-value} = 0.076 > 0.05$). 5

5 Results

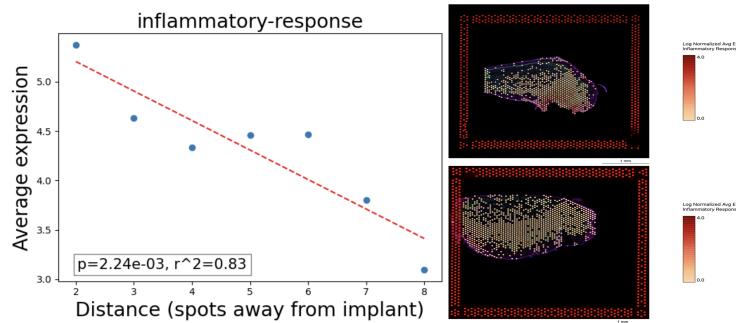


Figure 1: **Inflammatory response.** Left: regression. Top-right: acute stimulated. Bottom-right: control

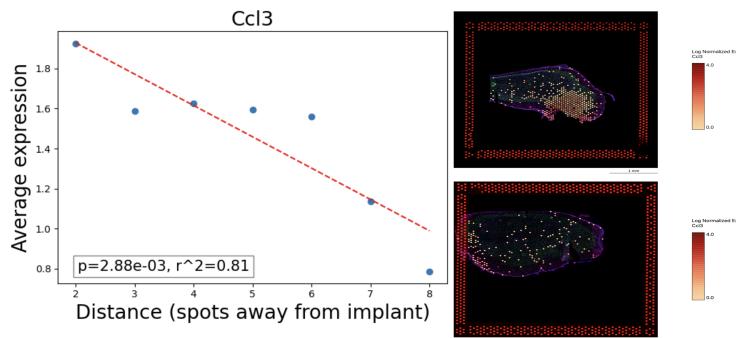


Figure 2: **Ccl3.** Left: regression. Top-right: acute stimulated. Bottom-right: control

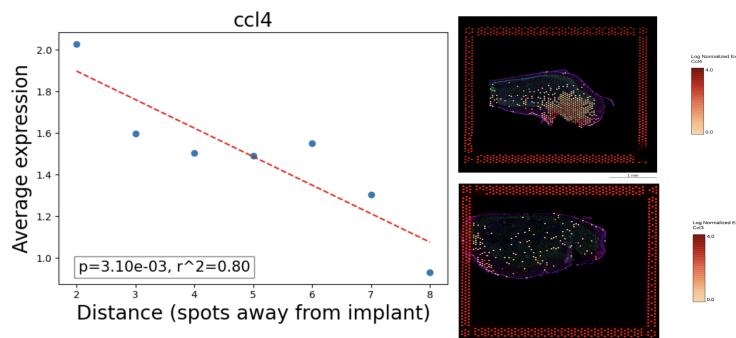


Figure 3: **Ccl4.** Left: regression. Top-right: acute stimulated. Bottom-right: control

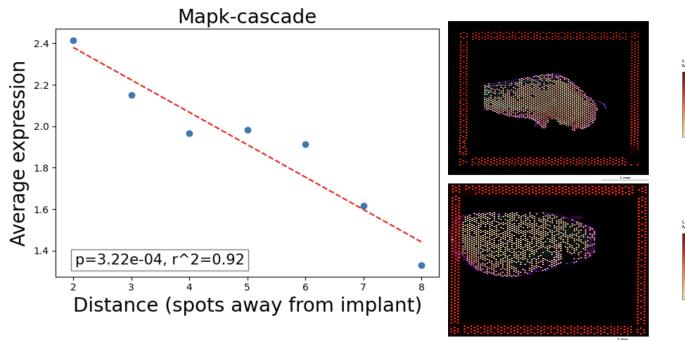


Figure 4: **Mapk cascade.** Left: regression. Top-right: acute stimulated. Bottom-right: control

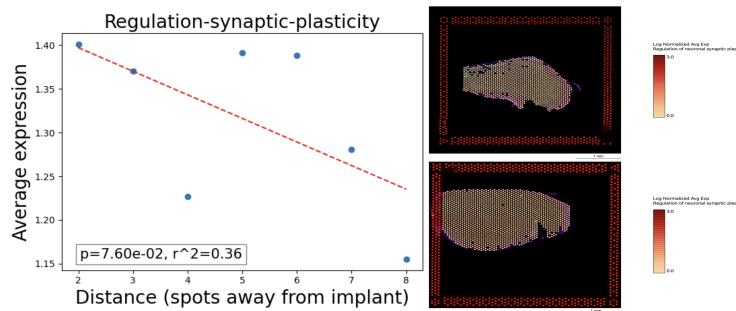


Figure 5: **Synapse plasticity.** Left: regression. Top-right: acute stimulated. Bottom-right: control

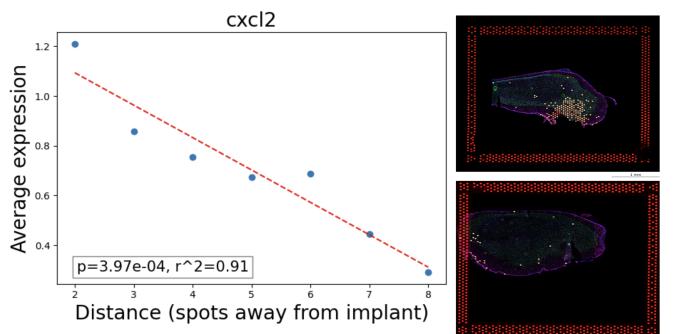


Figure 6: **Cxcl2.** Left: regression. Top-right: acute stimulated. Bottom-right: control

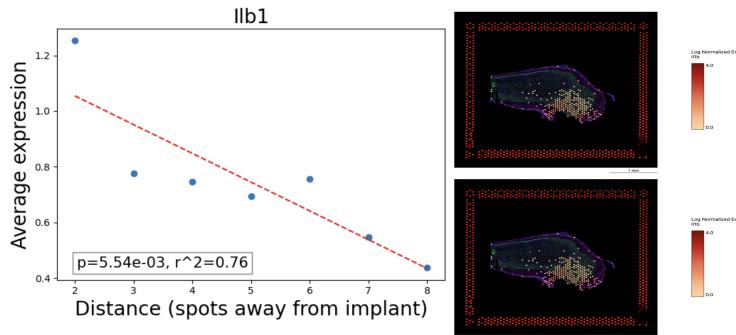


Figure 7: **Ilb1**. Left: regression. Top-right: acute stimulated. Bottom-right: control

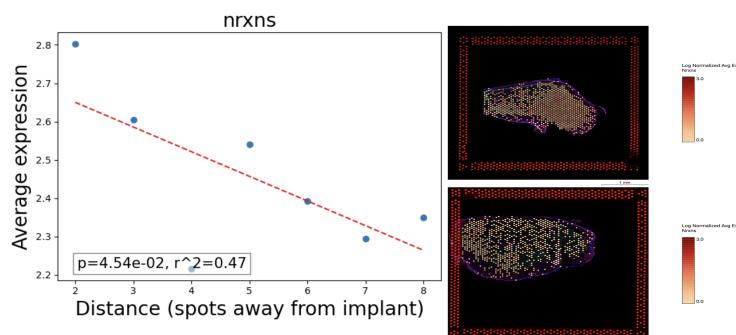


Figure 8: **Nrxns**. Left: regression. Top-right: acute stimulated. Bottom-right: control