

# Investigating the activity dependent dynamics of synaptic structures using biologically realistic modelling of peripheral lesion experiments

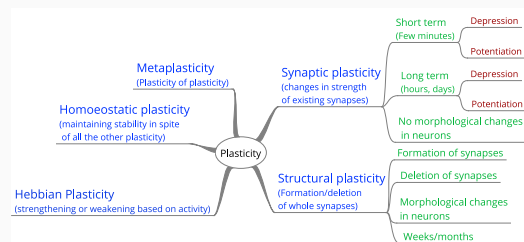
Discussion of my Ph.D. research

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1/4

## Context

### Plasticity while maintaining stability



2/4

### Structural plasticity in the adult brain

- All synaptic structures: axonal branches, boutons<sup>1</sup>, dendritic structures<sup>2</sup> in the adult brain are dynamic.

<sup>1</sup>Chen, J. L. et al. Structural basis for the role of inhibition in facilitating adult brain plasticity. *Nature neuroscience* **14**, 587–594 (2011)  
Marik, S. A. et al. Axonal dynamics of excitatory and inhibitory neurons in somatosensory cortex. *PLoS Biology* **8**, e1000395 (2010)  
Marik, S. A. et al. Large-scale axonal reorganization of inhibitory neurons following retinal lesions. *Journal of Neuroscience* **34**, 1625–1632 (2014)  
Stettler, D. D. et al. Axons and Synaptic Boutons Are Highly Dynamic in Adult Visual Cortex. *Neuron* **49**, 877–887. ISSN: 0896-6273 (2006)  
Gogolla, N. et al. Structural plasticity of axon terminals in the adult. *Current opinion in neurobiology* **17**, 516–524 (2007)  
<sup>2</sup>Holtmaat, A. J. G. D. et al. Transient and Persistent Dendritic Spines in the Neocortex In Vivo. *Neuron* **45**, 279–291. ISSN: 0896-6273 (2005)  
Chen, J. L. et al. Clustered dynamics of inhibitory synapses and dendritic spines in the adult neocortex. *Neuron* **74**, 361–373 (2012)  
Trachtenberg, J. T. et al. Long-term in vivo imaging of experience-dependent synaptic plasticity in adult cortex. *Nature* **420**, 788–794 (2002)  
Villa, K. L. et al. Inhibitory Synapses Are Repeatedly Assembled and Removed at Persistent Sites In Vivo. *Neuron* **89**, 756–769. ISSN: 1097-4199 (4 Feb. 2016)

3/4

### Activity dependent structural plasticity

- Hebbian structural plasticity is

4/4

## Methods

## Results and discussion