SANI Architecture - 2D Object Recognition Development Specification - 21 September 2021 - 20 August 2022

SANI convolution filters:
- Sequential convolution filters capture subfeatures invariant to transformations (deformations) of the subimage including for example rotation/scaling/translation/shearing.
- Low level filters typically correspond to edge (contrast) detection.

sequentially activated neuronal input neural network

image data

SANI Network

retinotopic/orientation map (V1)
simple cell RFs
(ON / OFF centre
constrast permutations)

SANI generation phase:
train network at current
resolution/orientation/translation

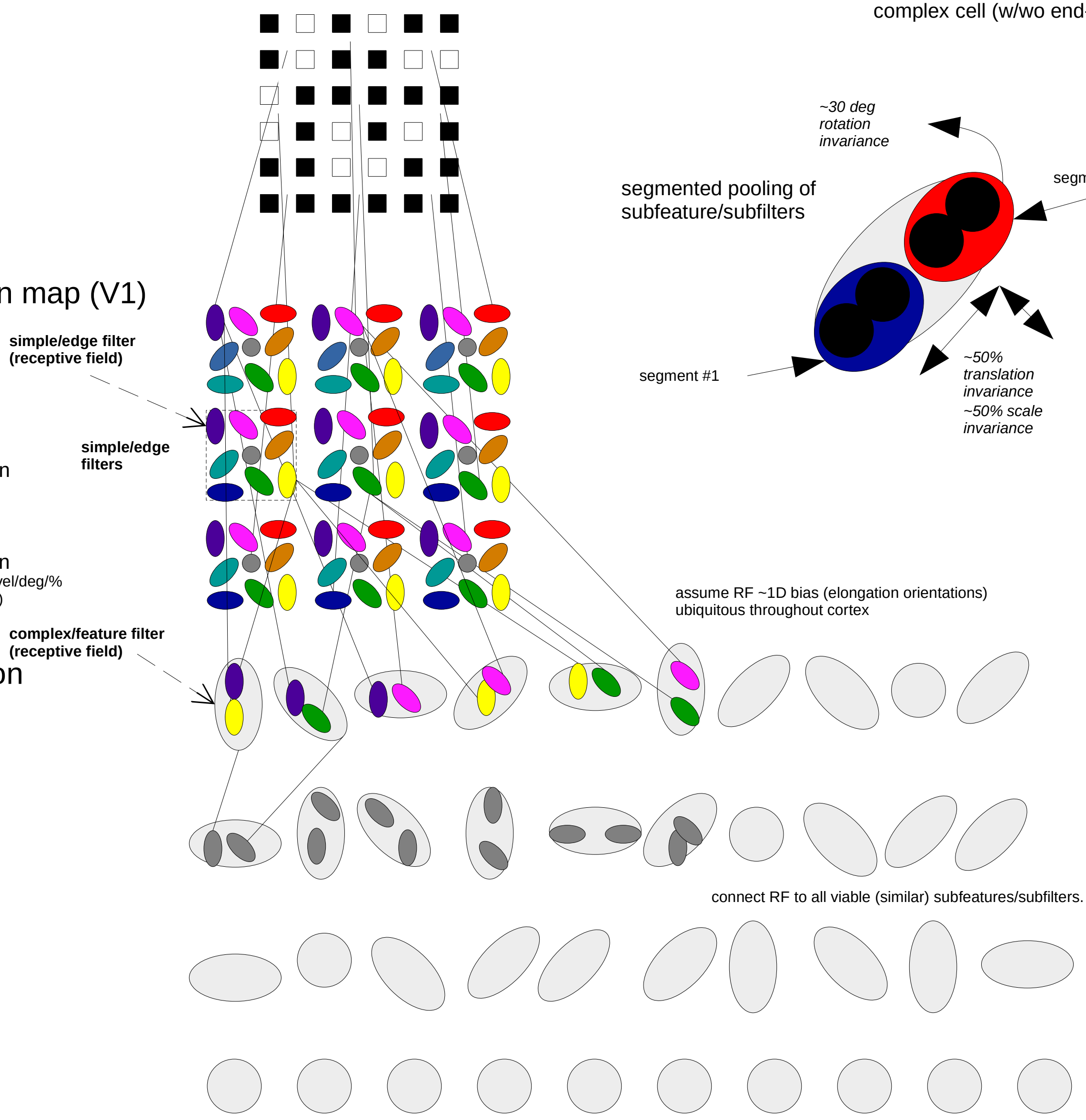
SANI detection phase:
sample image at current
resolution/orientation/translation
(depending on deformation invariance level/deg/%
captured by sequential convolution filters)

sequential convolution
filters (~V2+)
complex cell RFs
(subfeature/filter permuations)

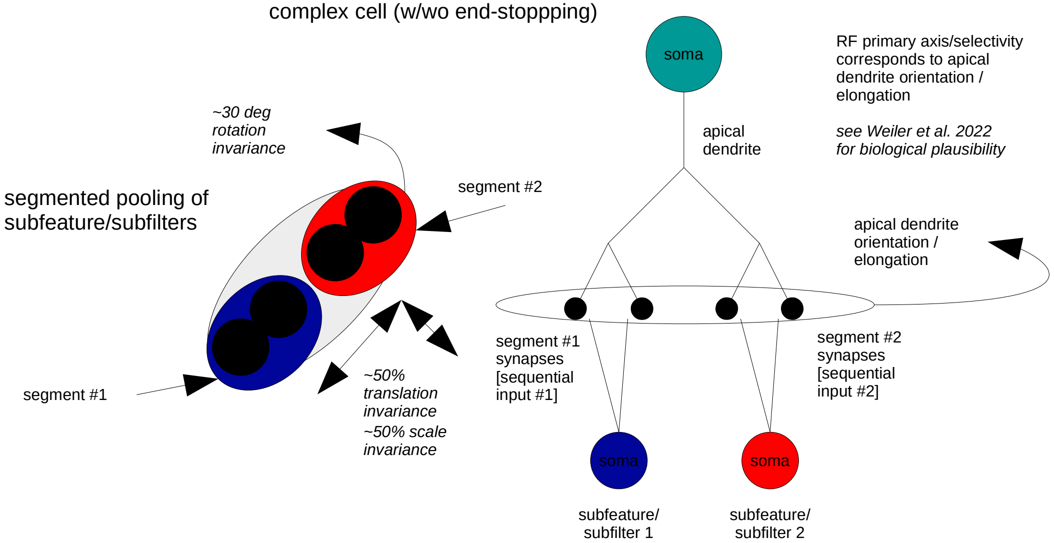
complex cell RFs
(subfeature/filter permuations)

complex cell RFs
(subfeature/filter permuations)

object identification



Receptive Field (RF) example
complex cell (w/wo end-stoppping)



SANI default/hybrid algorithm options:
- reuse kernels (sequential convolution filters) at different spatial locations in image as per default SANI specification
- detect sequential subfilters (ignoring precise amount of space/zero-contrast between them) as per default SANI speficiation

Algorithm advantages:
- Affine transformation invariance (local and global)
- Oneshot learning
- Robust memory (invariant to future additions)
- Component extraction / occlusion invariance
- Coherent feature/component binding/combination

- to further constrain affine invariance requirements, SANI network can be generated/trained with input data normalised with respect to 2 (e.g. gravitational/horizon or page/etc axes) or 3 (ATOR) features. Minimally, attention focus should aim at object centroids.
- SANI network can be spatio-temporal in the case of video data.

Algorithm requirements:
- Sequence index contiguity (connectivity) must be assured - ie all SANI node input must correspond to contiguous input data.