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Conservation of direction-dependent neural trajectories in primate motor cortex regardless of movement features

Andrea Colins Rodriguez, Mark D. Humphries

University of Nottingham

@AndreaColins

andrea.colinsrodriguez1@nottingham.ac.uk

andreacolinsr.github.io

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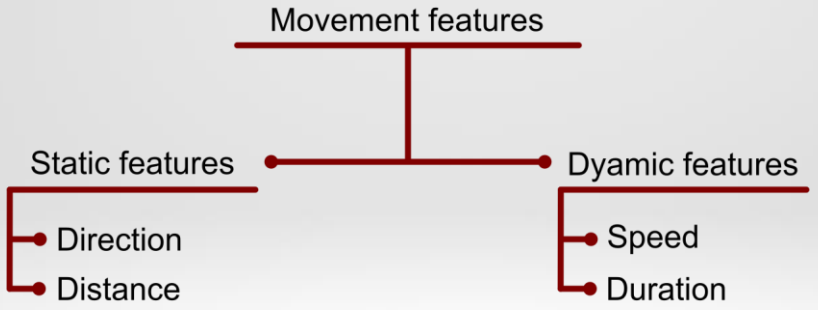
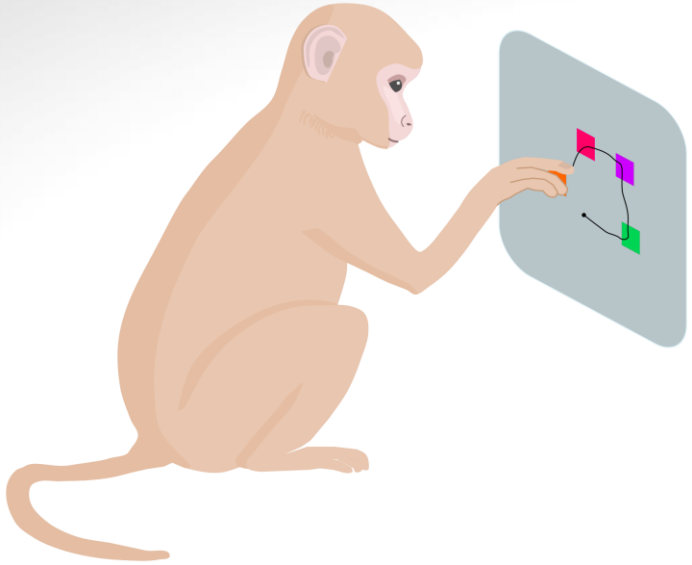
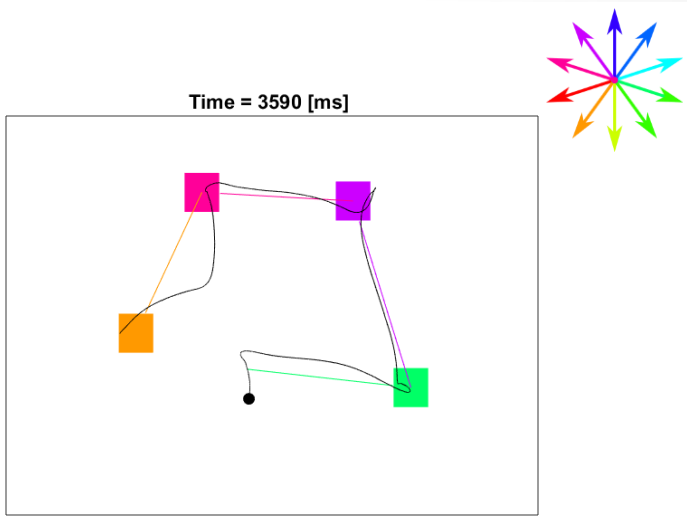
Coding static and dynamic movement features in arm movement task







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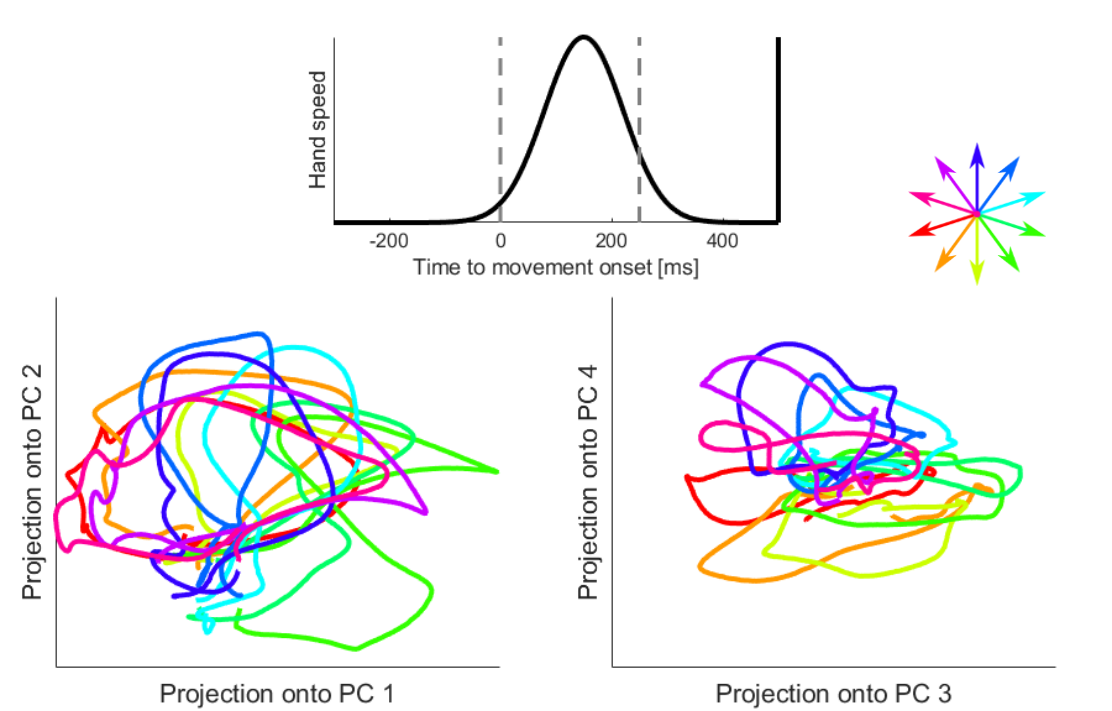
Neural trajectories recur to a region of the subspace



- Neural trajectories depend on movement direction
- Neural trajectories rotate around the origin

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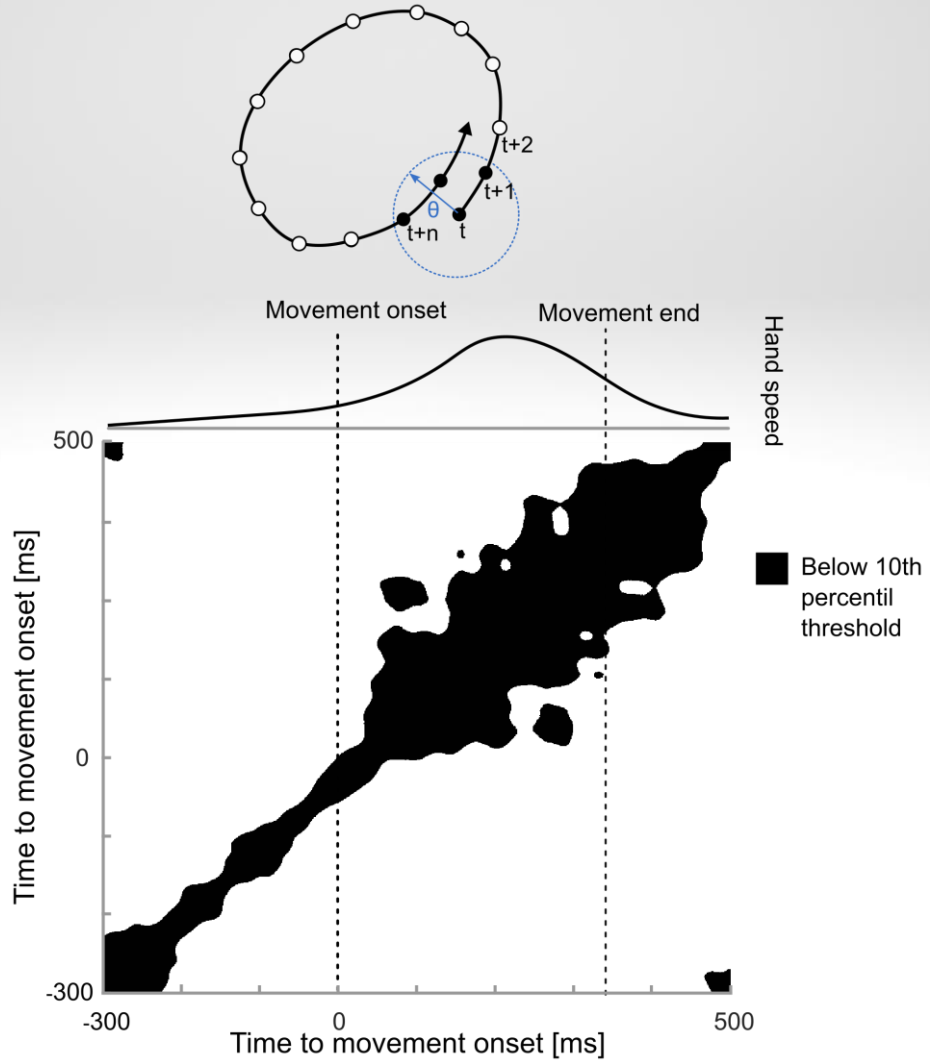
Neural trajectories recur to a region of the subspace



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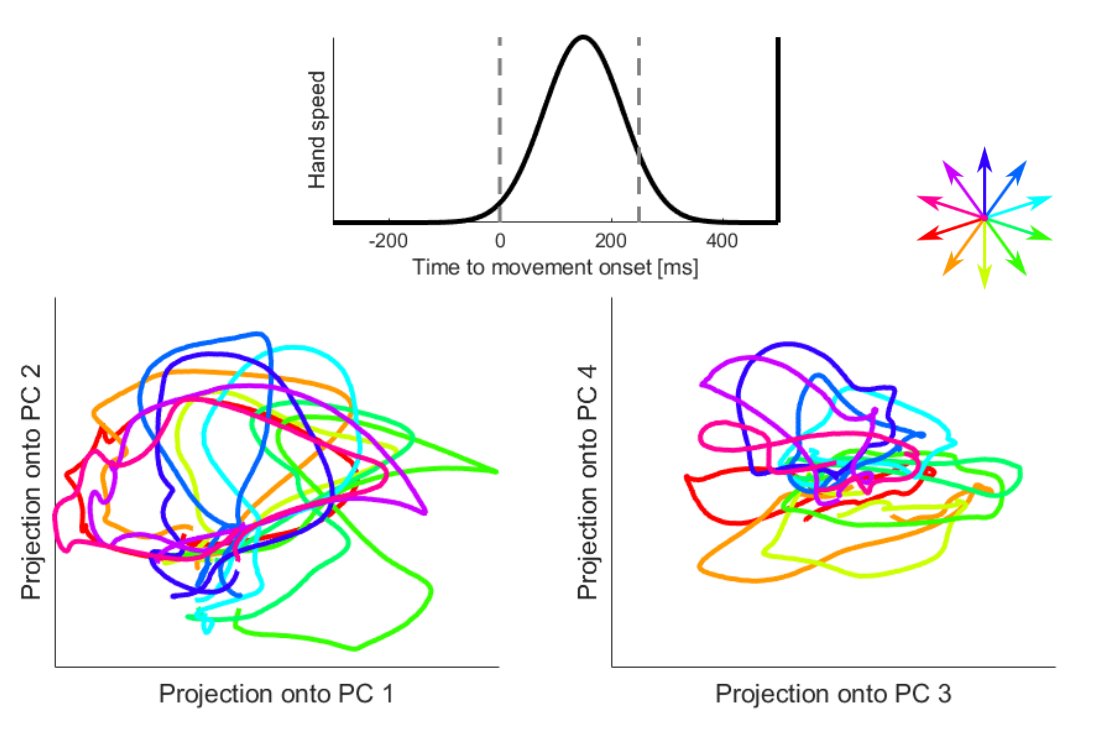
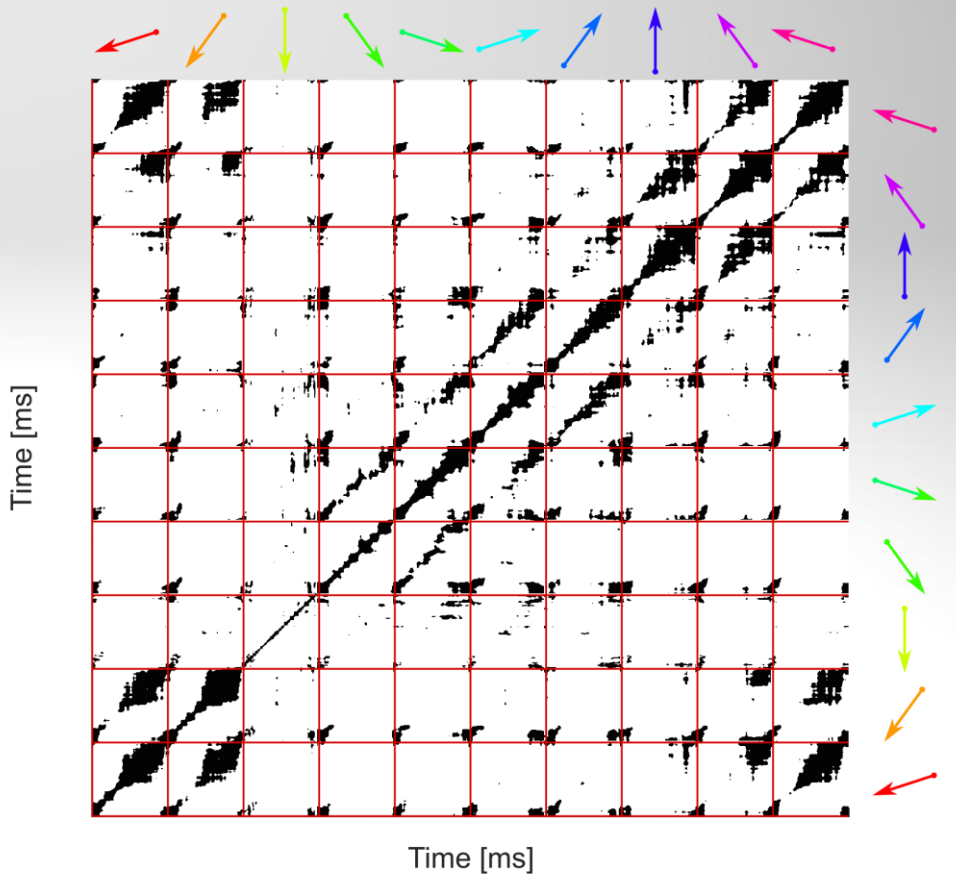
Neural trajectories recur to a region of the subspace





- Neural trajectories depend on movement direction
- Neural trajectories rotate around the origin

- All trajectories recur to the same region

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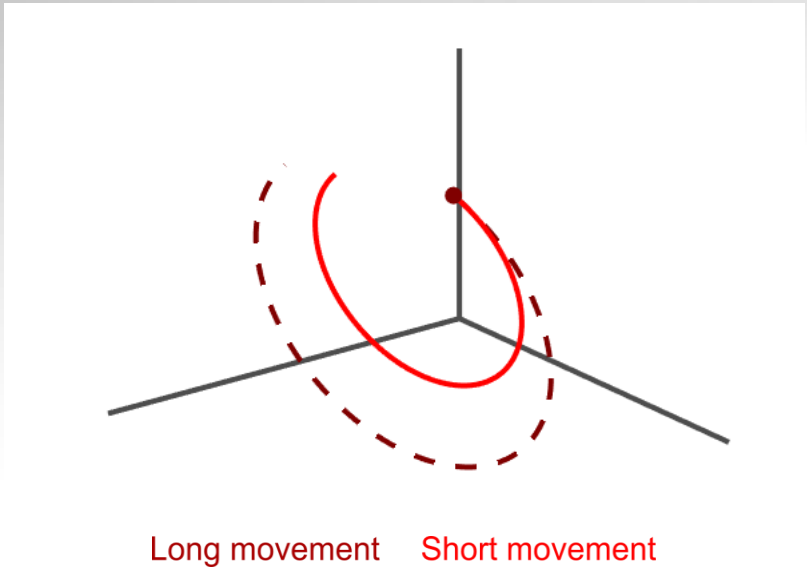
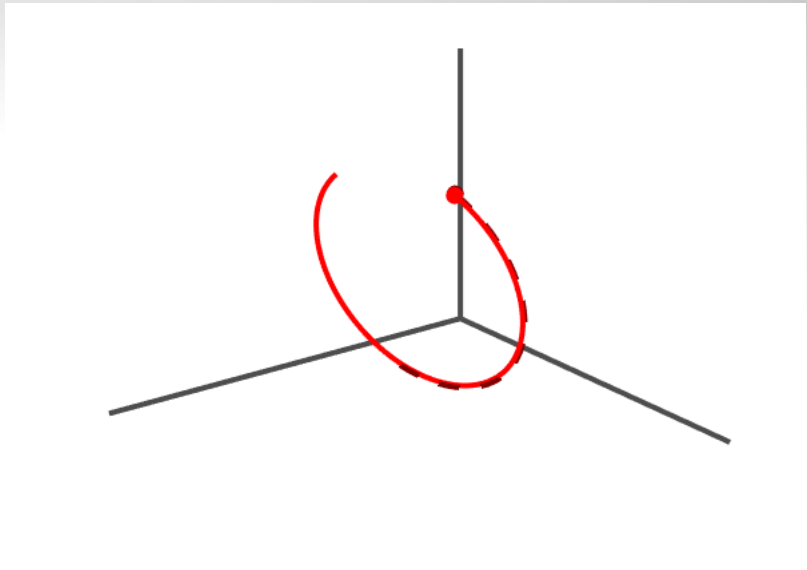
How other movement features can be encoded in the same subspace?

Change in geometry



Long movement Short movement

Change in unfolding rate



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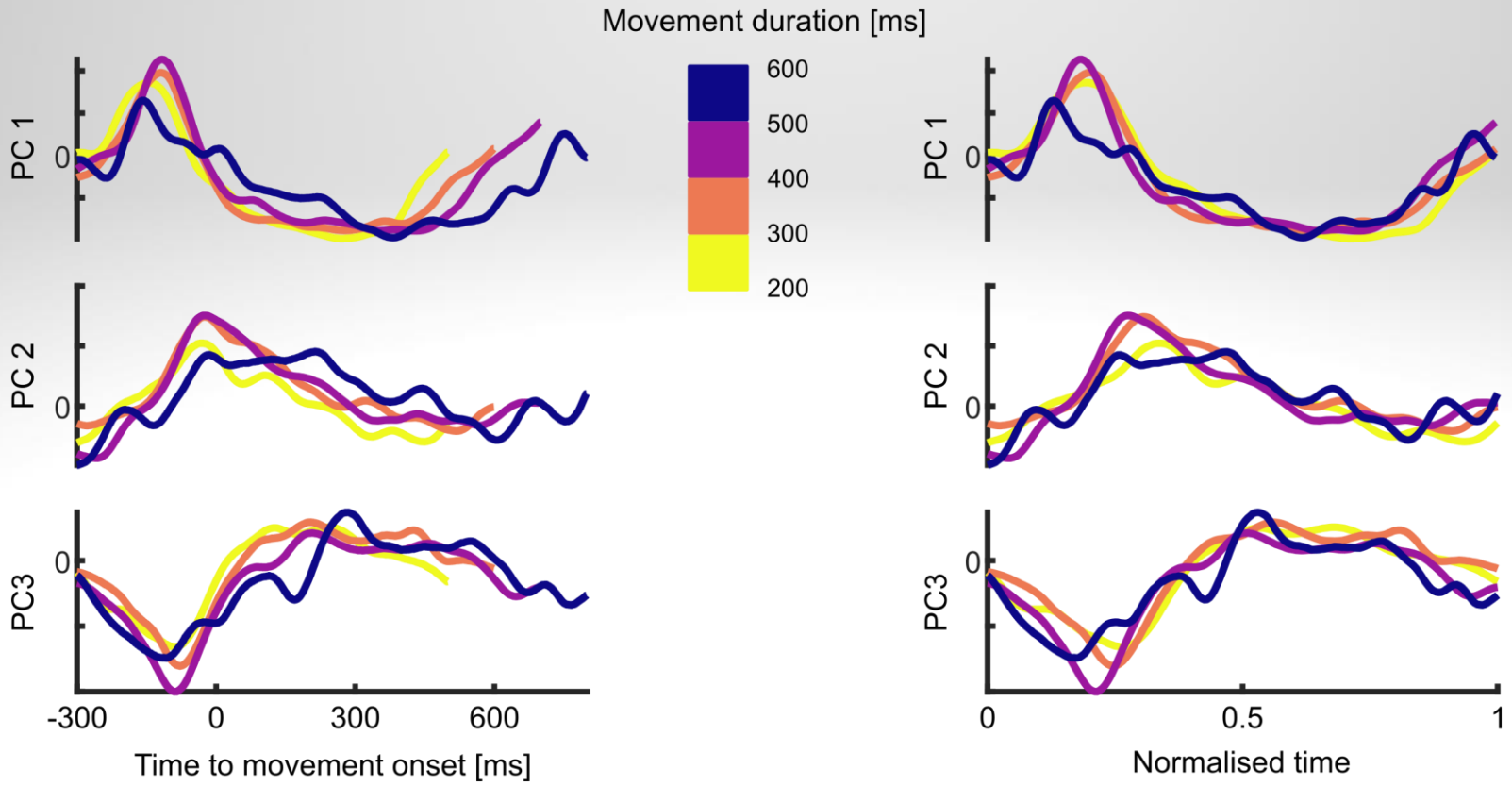
Movement's **duration** does not affect geometry of neural trajectories



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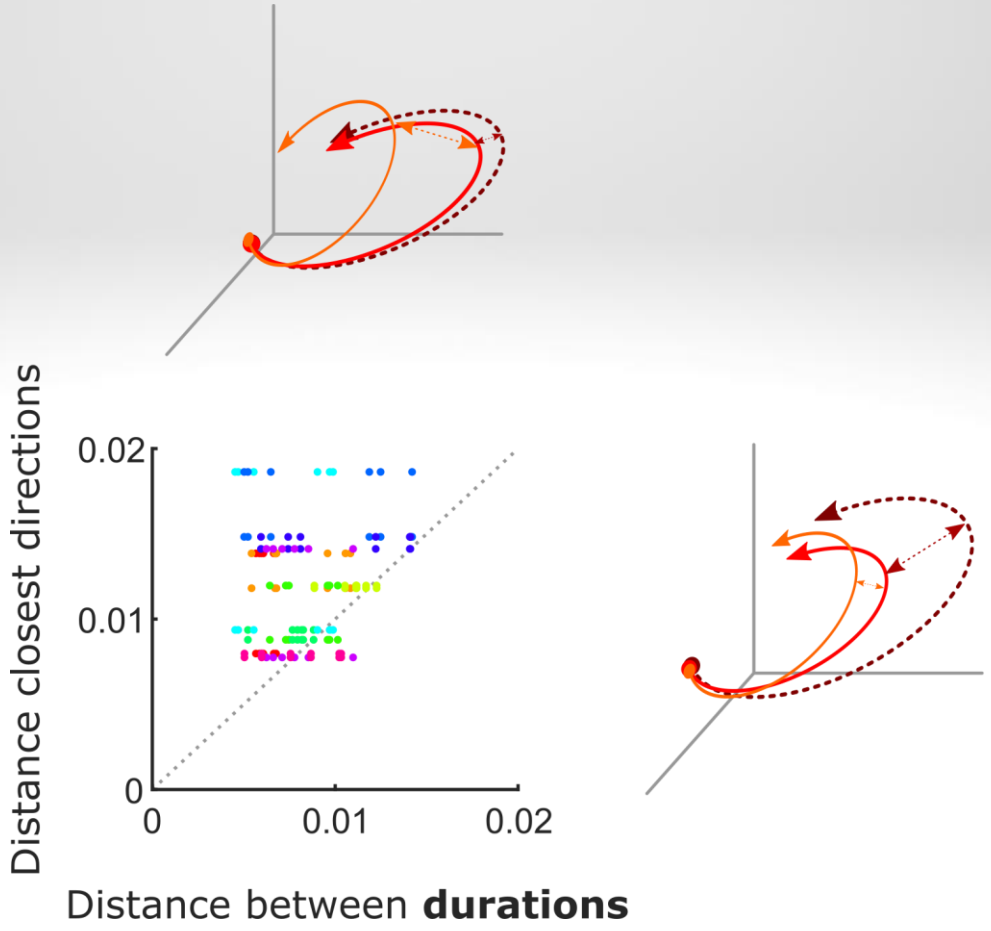
Movement's **duration** does not affect geometry of neural trajectories



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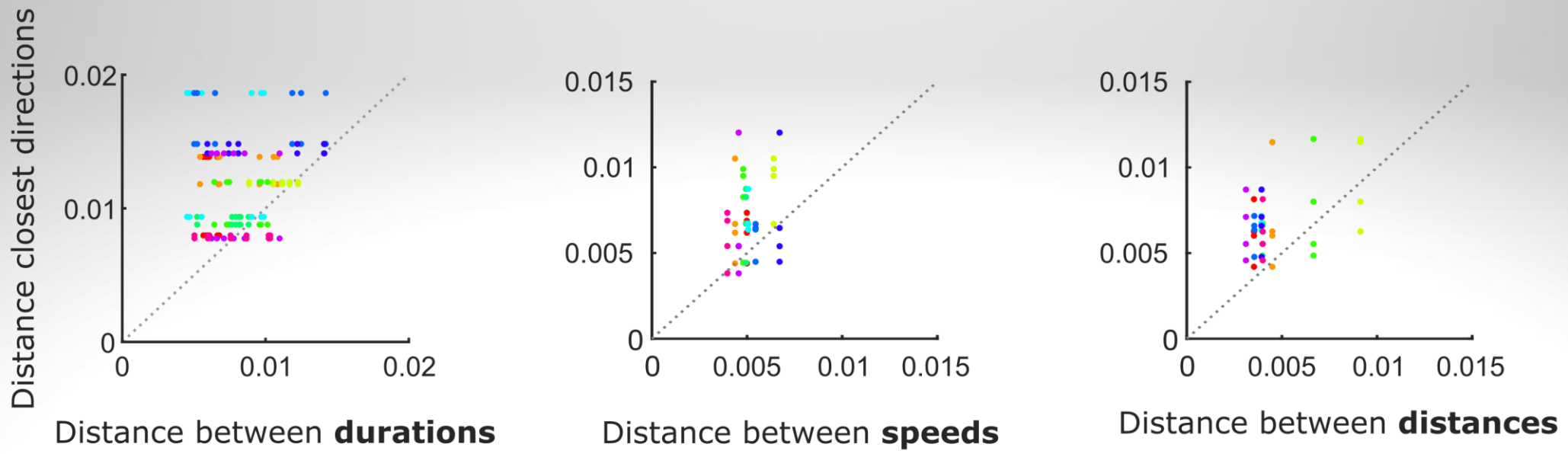
Movement's **speed** and **distance** do not affect geometry of neural trajectories



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Conclusions

- Neural trajectories were strongly stereotyped: the rotational trajectories started and ended in the same region of the subspace during each arm movement, regardless of that movement's direction, duration, distance or speed.

- While direction was encoded in the geometry of joint neural activity, other static and dynamic features of arm movement were not. Neural coding of these features of arm movement is superimposed on stereotyped trajectories of joint activity in motor cortex.