Spatiotemporal patterns such as traveling waves are frequently observed in recordings of neural activity. The mechanisms underlying the generation of such patterns are largely unknown. Previous studies have investigated the existence and uniqueness of different types of waves or bumps of activity using neural-field models, phenomenological coarse-grained descriptions of neural-network dynamics. But it remains unclear how these insights can be transferred to more biologically realistic networks of spiking neurons, where individual neurons free irregularly. Here, we employ mean-field theory to reduce a microscopic model of leaky integrate-and-fire (LIF) neurons with distance-dependent connectivity to an effective neural-field model depends on the mean and the variance in the synaptic input, both determining the amplitude and the temporal structure of the resulting effective coupling kernel. For the neural-field model we employ liner stability analysis to derive conditions for the existence of synaptic input, both determining the amplitude and the temporal oscillations and wave trains, that is, temporally and spatially periodic traveling waves. We first prove that wave trains cannot occur in a single homogeneous population of neurons, irrespective of the form of distance dependence of the connection probability. Compatible with the architecture of cortical neural networks, wave trains, earned quantitative agreement between predictions of the analytically tractable neural-field model and numerical simulations of both networks of nonlinear rate-based units and networks of LIF neurons.	doc_1		doc_2		decision
publication_date 2019-00-23 06:00-00 source journal volume doi https://web.archive.org/web/20200930054246/https://arxiv.org/pdf/1801.06046v2.pdf urls https://web.archive.org/web/20200930054246/https://arxiv.org/pdf/1801.06046v2.pdf urls https://web.archive.org/web/20200930054246/https://arxiv.org/pdf/1801.06046v2.pdf urls https://web.archive.org/web/20200930054246/https://arxiv.org/pdf/1801.06046v2.pdf urls https://web.archive.org/web/20200930054246/https://arxiv.org/pdf/1801.06046v2.pdf urls Spatiotemporal patterns such as traveling waves are frequently observed in recordings of neural activity. The mechanisms underlying the generation of such patterns are largely unknown. Previous studies have investigated the existence and uniqueness of different types of wave or bumps of activity using neural-field models, phenomenological coarse-grained descriptions of neural-network dynamics. But it remains unclear how these insights can be transferred to more biologically realistic networks of spoking neurous, where individual neurons fire irregularly. Here, we employ mean-field theory to reduce a microscopic model of leaky integrate-and-fire (LIF) neurons with distance-dependent connectivity to an effective coupling kernel the responsal input, both determining the amplitude and the temporal structure of the resulting effective coupling kernel. For the neural-field model is model, in contrast to existing phenomenological descriptions, the dynamics in this neural-field model we employ limer stability analysis to derive conditions for the existence of spatial and temporal oscillations and wave trains cannot occur in a single homogeneous population of neurons, irrespective of the form of distance dependence of the connection probability. Compatible with the arrains and and the temporal structure of the countering waves. We first conditions and spatial oscillations an	authors	 KarolÃna KorvasovÃ; Jannis Schuecker Espen Hagen, Tom Tetzlaff Markus Diesmann 	authors	 Hagen, Espen Helias, Moritz KorvasovÃ_i, KarolÃna Schuecker, Jannis Senk, Johanna 	
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volume doi urls • https://web.archive.org/web/20200930054246/https://arxiv.org/pdf/1801.06046v2.pdf id d-8141362539855483323 Spatiotemporal patterns such as traveling waves are frequently observed in recordings of neural activity. The mechanisms underlying the generation of such patterns are largely unknown. Previous studies have investigated the existence and uniqueness of different types of waves or bumps of activity using neural-field models, phenomenological coarse-grained descriptions of neural-network dynamics. But it remains unclear how these insights can be transferred to more biologically realistic networks of spiking neurons, where individual neurons free irregularly. Here, we employ mean-field theory to reduce a microscopic model of leave interpretation of the phenomenological descriptions of neural-field model. In contrast to existing phenomenological coarse-grained descriptions of neural-network dynamics. But it remains unclear how these insights can be transferred to more biologically realistic networks of spiking neurons, where individual neurons fire irregularly. Here, we employ mean-field theory to reduce a microscopic model of leavy integrate-and-free (LIF) neurons with distance-dependent connectivity to an effective neural-field model. In contrast to existing phenomenological descriptions, the dynamics in this neural-field model we employ line stability analysis to derive conditions for the existence of spatial and temporal oscillations and wave trains, that is, temporally and spatially periodic traveling waves. We first prove that wave trains cannot occur in a single homogeneous population of neurons, irrespective of the form of distance dependence of the connection probability. Compatible with the architecture of cortical neural networks, wave trains cannot occur in a single homogeneous population of neurons, irrespective of the form of distance wave trains cannot occur in a single homogeneous population of neurons, irrespective of the form of distance dependence of the connection pr	source	SupportedSources.INTERNET ARCHIVE	source	SupportedSources.CORE	
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