

University	Saint Petersburg Electrotechnical University “LETI”
Level of English language proficiency	Fluent in spoken and written English
The direction of training for which the graduate student will be accepted	Power and Electrical Engineering Computer Systems Engineering and Informatics
List of research projects of a potential supervisor (participation/guidance)	<ol style="list-style-type: none"> 1. Development and research of energy-efficient high-frequency converters of electrical energy (electric drive systems), linearized on the basis of polynomial precompensators. 2014. Participant. 2. Development and research of autonomous on-board control systems for robotic mobile objects and automation means for energy-saving electrical and electrotechnical complexes. 2015. Participant. 3. Study of complex compounds with pronounced nonlinear properties: their synthesis and interaction with external fields. 2016–2020. Participant. 4. Mathematical modeling of memristive converters. 2021-2024. Project supervisor.
List of possible research topics	Mathematical modeling of nonlinear dynamic systems based on neural networks and functional polynomials. Building control systems of bio-inspired robots movement. Nonlinear processing of image, speech and text signals.
 <p>Research supervisor: Elena B. Solovyeva, Doctor of Science: St. Petersburg Electrotechnical University “LETI”, 2002, St. Petersburg</p>	Research of neural networks, memristors and memristive structures for modeling nonlinear electrical devices (filters of non-Gaussian noise, compensators of nonlinear distortion, nonlinear converters, detectors, equalizers, etc.), control of bio-inspired robots and automatic manipulators.
	Supervisor’s research interests: Neural networks and functional polynomials as models of nonlinear systems. Mathematical modeling of memristors and memristive devices. Synthesis of nonlinear digital filters and compensators. Control systems for bio-inspired robots and automatic manipulators based on artificial intelligence.
	Research highlights: Experimental investigations will be carried out in using real memristors and memristor-based devices, complex NI ELVIS, software based on Matlab, LTspice, Python, LabView. We have the extended cooperation with several foreign teams, as well as with several leading Universities and Laboratories in St. Petersburg, Moscow, Germany etc.
	Supervisor’s specific requirements: Skills in electrical engineering theory and mathematics. Deep knowledge of undergraduate courses, such as: <ul style="list-style-type: none"> • Functional Analysis • Nonlinear Dynamics • Digital Signal Processing • Neural networks
	Supervisor’s main publications:

	<p>Total amount of papers indexed by WoS and SCOPUS within the last 5 years is over 25.</p> <p>Solovyeva E., Schulze S., Harchuk H. Behavioral modeling of memristor-based rectifier bridge.– Applied Sciences.– 2021.– Vol. 11, № 7, 2908.DOI: 10.3390/app11072908</p> <p>Solovyeva E., Abdullah A. Binary and Multiclass Text Classification by Means of Separable Convolutional Neural Network.– Inventions.– 2021.– Vol. 6, no. 4, 70. DOI: 10.3390/inventions6040070</p> <p>Korovkin N.V., Minevich T.G., Solovyeva E.B. Monitoring of electricity consumption by measurements at selected network nodes.– Russian Electrical Engineering.– 2021.– Vol. 92, no. 3, pp.145–149. DOI: 10.3103/S106837122103007X</p> <p>Solovyeva E.B., Abdullah A. Controlling system based on neural networks with reinforcement learning for robotic manipulator. Informatsionno-upravliaiushchie sistemy [Information and Control Systems], 2020, no. 5, pp. 24–32. DOI: 10.31799/1684-8853-2020-5-24-32</p> <p>Solovyeva E.B., Harchuk H.A. “Model of Bernoulli memristors in the form of split signals polynomial” // Bulletin of the South Ural State University. Ser. Mathematical Modelling, Programming & Computer Software (Bulletin SUSU MMCS), 2020, vol. 13, no. 3, pp. 86–92. DOI: 10.14529/mmp200309</p> <p>Solovyeva E. Cascade non-linear filters for image recovery. Procedia Computer Science. 2019. Vol. 150. pp.109-115. DOI: 10.1016/j.procs.2019.02.023</p> <p>Solovyeva E. Compensator models based on block-oriented neural networks. Journal of Physics: Conference Series (JPCS). 2019. Vol. 1333. 032080, pp.1–6. DOI: 10.1088/1742-6596/1333/3/032080</p> <p>Solovyeva E. Recurrent neural networks as approximators of nonlinear filters operators. Journal of Physics: Conference Series. 2018. Series 1141, 012115, pp.1–10. DOI: 10.1088/1742-6596/1141/1/012115</p> <p>Solovyeva E. Behavioural nonlinear system models specified by various types of neural networks. Journal of Physics: Conference Series (JPCS). 2018. Vol. 1015. 032139, pp.1–6. DOI: 10.1088/1742-6596/1015/3/032139</p>
	<p>Results of intellectual activity:</p> <p>Patent № RU 197110 U1. 2019. Corrector of nonlinear distortion in power amplifier.</p> <p>Program for approximation of memristors transfer characteristics based on polynomials of split signals (PMTCM_SP). 2019. Certificate № 2019617558.</p> <p>Program for piecewise neural approximation of nonlinear memristor operators with harmonic input signals (PPWNA_SP). 2020. Certificate № 2020614251.</p> <p>Control of robot manipulator model using the deep deterministic policy gradient method (RM_DDPG). 2020. Certificate № 2020613771.</p>