**Roadmap of STRA-U ‘Cognitive Neuroscience: From Computational Models to Neurotechnology’**

**I. Goal:** To establish a research and educational center of excellence that integrates cognitive neuroscience and information science in order to construct interdisciplinary models of human behavior and to implement these models in the cutting-edge neurotechnologies.

**II. Main Objectives:**

* Developing new interdisciplinary models of normal and pathological behavior, including computational models of perception, communication and decision-making;
* Implementing the achievements of modern cognitive neurosciences, information sciences and cognitive psychology in neurotechnologies for regeneration, preservation and enhancement of human brain resources as well as for integration of human brain with IT and robotic devices;
* Providing research and educational support to the NeuroNet national technological initiative (NTI) in neurotechnology aimed at integrating modern global technologies of life sciences with novel data mining algorithms and robotic devices;
* Launching interdisciplinary post-graduate’s and Master’s neurotechnology and cognitive neuroscience programs in English that will be competitive on the global education market.

**III. Main Anticipated Deliverables:**

* The first Russian research center in neuroeconomics: neurobiological mechanisms of decision-making;
* National platform for integrating interdisciplinary (combining social, economic, cognitive and information sciences) studies of human behavior using hi-tech “neuroimaging” approaches. This initiative will help HSE be a part of the global modern research in bioscience;
* Cutting-edge software for mapping the complex cortical activity in the human brain;
* New brain stimulation protocols for research and diagnostic study of the patients;
* New-generation communicative systems: brain-computer, interfaces integrated with biofeedback algorithms;
* New approaches for prediction of behavior and optimization of decision-making in different social contexts;
* Unified database of the experimental neurophysiological data for interdisciplinary research;
* Launch of the joint Master-Doctoral level tracks in cognitive sciences and neurotechnologies;
* Synchronization of the curricula between Master’s programs “Cognitive Sciences and Technologies: From Neuron to Knowledge”, <https://www.hse.ru/en/ma/cogito/> (Faculty of Social Sciences) and “Data Analysis in Biology and Medicine” (Faculty of Computer Science);
* Recognition of HSE in the international academic community, based on the university’s position in top global rankings: HSE should rank in the Top 100 of QS World University Ranking by Faculty in Social Sciences & Management, in the Top 100 of QS World University Ranking by Subject in Economics & Econometrics and in the Top 150 of QS World University Ranking by Subject in Psychology.

**IV. Target indicators**

|  |  |  |  |
| --- | --- | --- | --- |
| **№** | **Indicator** | **Unit of measurement** | **Results** |
| **Actual 2015**  | **Actual** **2016** | **Plan** **2017**  | **Plan** **2018**  | **Plan** **2019**  | **Plan** **2020**  |
| 1. | Position in the QS ranking by faculty: Social Sciences & Management | position | 161 | 151-200 (planned) | 151-200 | 101-150 | 51-100 | 51-100 |
| 2. | Position in the QS ranking by subject: Psychology | position | - | - | - | - | 151-200 | 101-150 |
| 3. | Position in the QS ranking by subject: Economics & Econometrics | position | 151-200 | 101-150 | 151-200 | 101-150 | 101-150 | 51-100 |

**V. Action Plan\***

| **No.** | **Planning** | **Timeframe for implementation***(check “X” in relevant graphs)* | **Results***(description and indicator, for 2016-20)* | **Responsible persons***(for 2016)* |
| --- | --- | --- | --- | --- |
| **2016** | **2017** | **2018** | **2019** | **2020** |
| **Apr - Sept** | **Oct-Dec** |
|  | **1. Organizational measures** |
| 1.1. | Development of the STRA-U’s organizational structure | X |  |  |  |  |  |  | Klucharev, V.A. |
| 1.1.1. | Approval of the STRA-U’s management committee, as well as its functions and system of operations |  | X |  |  |  |  | Rector’s directive on the STRA-U’s management committees; approved regulation on the STRA-U | Klucharev, V.A. |
| 1.1.2. | STRA-U’s international advisory council composition, along with its functions and system of operation is approved |  | X |  |  |  |  | Rector’s directive on the STRA-U’s international advisory council; approved regulation on the STRA-U | Shtyrov, Y.Y. |
| 1.2. | STRA-U’s internal structure (participating subdivisions and procedures for adding/removing a subdivision) is confirmed | X | X |  |  |  |  | Rector’s directive on a list of subdivisions based out of the unit | Klucharev, V.A. |
| 1.3. | An interaction among the STRA-U’s subdivisions and a decision-making model for the unit’s operation are confirmed | X | X |  |  |  |  | Approved regulation on the STRA-U | Klucharev, V.A. |
| 1.4. | STRA-U project teams are established and of necessary material and informational resources for their operation are identified. | X | X |  |  |  |  | Protocol of the STRA-U’s management committee providing a list of key projects (educational, research projects, etc.), as well as the composition of relevant project teams | Klucharev, V.A. Belyanin, A.VDragoy, O.V.Utochkin, I.S.Shestakova, A.N. |
| 1.5. | STRA-U’s management committee and international advisory council reviewed three-year action plan for the unit’s academic and research development  |  | X |  |  |  |  | Protocols of the STRA-U’s management committee and international advisory council on approval of the Roadmap, including plans for the unit’s academic and research development  | Shtyrov, Y.Y. |
| 1.6. | Revenue indicators for the STRA-U are developed |  | X |  |  |  |  | Forecast revenue estimate for the STRA-U (to be updated annually); protocol of the STRA-U’s management committee on the unit’s planned revenue (subject to approval by the Planning and Finance Office)  | Klucharev, V.A. Belyanin, A.V.Dragoy, O.V.Utochkin, I.S.Shestakova, A.N. |
| 1.7. | Outreach, information and dissemination  |  | X | X | X | X | X | 2016 – creation of the STRA-U’s own webpage on the HSE corporate portal; - appointing the person responsible for information about the unit published on the portal; - updating of the STRA-U’s website; - maintaining a news ticker. | Klucharev, V.A. |
| **2. Development of Teaching and Learning Activities** |
| 2.1. | Improving current and starting up new educational programmes |  |  |  |  |  |  |  |  |
| 2.1.1 | Reformatting and improving current educational programs |  |  |  |  |  |  |  |  |
| 2.1.1.1. | Developing the ’Cognitive Sciences and Technologies: From Neuron to Cognition’ Master’s programme |  |  |  |  |  |  |  |  |
| 2.1.1.1.1. | Signing partnership agreements with leading international universities |  |  |  | X |  |  | *Number of partnership agreements with leading international universities:*2018 – 2. | Shestakova, A.N. |
| 2.1.1.1.2. | Signing partnership agreements with leading Russian universities |  |  | Х | Х |  |  | *Number of partnership agreements with leading Russian universities:*2018 – 2, 2017 – 1, 2018 – 1. | Shestakova, A.N.Shtyrov, Y.Y.Gutkin, B.S. |
| 2.1.1.1.3 | Signing partnership agreements with leading Russian research centres with respect to supervising student theses  |  |  | Х | X | Х | Х | *Number of partnership agreements with leading Russian research centres:* 2017 – 1, 2018 – 2, 2019 – 1, 2020 – 1. | Shestakova, A.N. |
| 2.1.1.1.4 | Synchronizing the curricula of two Master’s programmes – ‘Cognitive Sciences and Technologies: From Neuron to Cognition” and “Data Analysis for Biology and Medicine’ |  |  |  | X | X | Х | *Number of synchronized courses:*2018 – 2, 2019 – 4, 2020 – 5. | Shestakova, A.N. |
| 2.1.1.1.5 | Inviting visiting professors from top foreign universities (e.g., École normale supérieure – Paris, Aarhus University Charité - Universitätsmedizin Berlin, Goldsmiths, University of London, etc.) |  |  |  | X | X | Х | *Number of visiting professors from top universities:*2018 – 3, 2019 – 4, 2020 – 5. | Shestakova, A.N. |
| 2.1.1.1.6 | Promoting Master’s and doctoral programmes  |  |  |  | X | X | Х | *Number of events aimed at supporting students and graduates in their efforts to enroll in doctoral programmes and graduate schools:*2018 – 1, 2019 – 2, 2020 – 2. | Shestakova, A.N. |
| 2.1.1.1.7 | Upgrading syllabi of introductory courses  |  |  | Х | Х | Х | Х | *Number of adaptation course syllabuses to be upgraded:*2017 – 2, 2018 – 2, 2019 – 2, 2020 – 2. | Shestakova, A.N. |
| 2.1.1.1.8 | Developing an integrated Master’s-doctoral track and synchronizing its academic and research components |  |  | Х | Х | Х | Х | By 2018, all preliminary steps towards creating an integrated Master’s-doctoral track shall be completed.  | Klucharev, V.A. Shestakova, A.N. |
| 2.1.2. | Integrating English-taught courses and online courses into curricula  |  |  |  |  |  |  |  |  |
| 2.1.2.1 | Developing online courses hosted on the Coursera platform |  | Х | Х | Х | Х | Х | *Number of courses hosted on Coursera:*2016 – 1, 2017 – 1, 2018 – 1, 2019 – 2, 2020 – 2.*Number of registered users for English-taught online courses hosted on Coursera:*2016 – 5,000, 2017 – 5,000, 2018 – 10,000, 2019 – 10,000, 2020 – 10,000.*Number of users who have completed English-taught online courses hosted on Coursera:*2016 – 3,000, 2017 – 3,000, 2018 – 5,000, 2019 – 7,000, 2020 – 7,000. | Shestakova, A.N. Klucharev, V.A. |
| 2.1.3. | Incorporating research components into educational programmes, involve Master’s and doctoral students in STRA-U’s research  |  |  |  |  |  |  |  |  |
| 2.1.3.1 | Involving (doctoral) students in research implemented by the STRA-U’s subdivisions (laboratories, including international ones) | ХХ | ХХ | Х Х | Х | Х | Х | Centre for Cognition & Decision Making*Number of students/doctoral students engaged in research:* 2016 – 4/9, 2017 – 4/7, 2018 – 4/7, 2019 – 4/7, 2020 – 5/10.Laboratory for Cognitive Research*Number of students/doctoral students engaged in research:* 2016 – 8/1, 2017 – 8/1, 2018 – 8/1, 2019 –7/2, 2020 – 7/2.Neurolinguistics Laboratory *Number of students/doctoral students engaged in research:*2016 – 6 / 0, 2017 – 6/1, 2018 – 6/1, 2019 – 6/1, 2020 – 6/1.Laboratory for Experimental and Behavioural Economics*Number of students/doctoral students engaged in research:*2016 – 3/0, 2017 – 4/1, 2018 – 4/2, 2019 – 5/2, 2020 – 5/3. | Shestakova, A.N.Utochkin, I.S.Dragoy, O.V. Belyanin, A.V. |
| 2.1.3.2 | Engaging (doctoral) students in grant projects and other research | ХХ | ХХ | Х Х | Х | Х | Х | *Project:* (а) Neuroeconomics Models of Decision-making in Various Social Contexts*Number of students/doctoral students engaged in a grant project/research project:*2016 – 4/2, 2017 – 4/2, 2018 – 4/2, 2019 – 4/2, 2020 – 4/2.(b) Prosocial and Antisocial Behavior: Motives, Factors and Applications *Number of students/doctoral students engaged in a grant project/research project:*2016 – 4/2, 2017 – 4/2, 2018 – 4/2, 2019 – 4/2, 2020 – 4/2.*Project:* Dynamic Brain Connectomics: Algorithms, Paradigms and Tools *Number of students/doctoral students engaged in a grant project/research project:*2016 – 4/2, 2017 – 4/2, 2018 – 4/2, 2019 – 4/2, 2020 – 4/2.*Project:* (а) Statistical Representation of Information in Perception and Visual Memory*Number of students/doctoral students engaged in a grant project/research project:*2016 – 4/2, 2017 – 4/2, 2018 – 4/2, 2019 – 4/2, 2020 – 4/2.(b) Preattentive (sensory) and mnemonic factors in controlled visual search*Number of students/doctoral students engaged in a grant project/research project:* 2016 – 4/2, 2017 – 4/2, 2018 – 4/2, 2019 – 4/2, 2020 – 4/2/*Project:* A Universal ‘Brain-Computer Interface with Biofeedback’ That Can Be Used Individually or by a Group of Individuals*Number of students/doctoral students engaged in a grant project/research project:*2016 – 0, 2017 – 3/3, 2018 – 3/3, 2019 – 3/3, 2020 – 3/3.*Project:* (а) Neuronal Foundations of Language Grammar: Universal Effects and Those Typical of Specific Languages*Number of students/doctoral students engaged in a grant project/research project:*2016 – 6/0.(b) Brain Functions Underlying Speech Disorders*Number of students/doctoral students engaged in a grant project/research project:*2017 – 6/1, 2018 – 6/1, 2019 – 6/1, 2020 – 6/1.Grants from the Russian Science Foundation*Number of students/doctoral students engaged in a grant project/research project:*2016 – 6/5, 2017 – 2/2, 2018 – 3/3, 2019 – 3/3, 2020 – 4/4.State contracts under the Federal Targeted Programme, R&D contracts *Number of students/doctoral students engaged in a grant project/research project:*2016 – 3/1, 2017 – 3/1, 2018 – 3/1, 2019 – 3/1, 2020 – 426.Grants from the Russian Foundation for Basic Research and the Russian Foundation for the Humanities*Number of students/doctoral students engaged in a grant project/research project:*2016 – 12/4, 2017 – 12/4, 2018 – 12/4, 2019 – 12/4, 2020 – 12/4. | Shestakova, A.N.Utochkin, I.S.Dragoy, O.V. Belyanin, A.V. |
| 2.1.3.3 | (Doctoral) students’ participation in research seminars |  |  | Х | Х | Х | Х | *Number of students/doctoral students attending* *research seminars:*2016 – 55/14, 2017 – 65/14, 2018 - 65/14, 2019 – 65/14, 2020 – 65/14. | Shestakova, A.N.Utochkin, I.S.Dragoy, O.V. Belyanin, A.V. |
| 2.1.3.4 | (Doctoral) students’ participation in academic conferences and schools (of thought) |  |  |  | Х | Х | Х | *Number of students/doctoral students attending academic conferences:*2016 – 19/8, 2017 – 19/10, 2018 – 19/10, 2019 – 19/10, 2020 – 19/10. | Shestakova, A.N.Utochkin, I.S.Dragoy, O.V.Belyanin, A.V |
| 2.2 | Developing academic mobility programmes for (doctoral) students  |  |  |  |  |  |  |  |  |
| 2.2.1 | - under Erasmus + programme | X | Х | Х | Х | Х | Х | Long-term programmes*Number of students participating in long-term programmes:*2016 – 1, 2017 – 2, 2018– 2, 2019 – 2, 2020 – 2 | Shestakova, A.N. |
| 2.2.2. | - under agreement with Aalto University | X | Х | Х | Х |  |  | Long-term programmes*Number of students participating in long-term programmes:*2016 – 0, 2017 – 2, 2018 – 1. | Shestakova, A.N. |
| 2.2.3 | - under agreement with École normale supérieure – Paris | X | Х | Х | Х | Х | Х | Long-term programmes*Number of (doctoral) students participating in long-term programmes:*2016 – 0, 2017 – 1, 2018 – 1, 2019 – 1, 2020 – 1. | Shestakova, A.N. |
| 2.2.4. | Other types of mobility (at students’ own initiative, under HSE grants or those awarded by other organizations)  | X | Х | Х | Х | Х | Х | Short-term programmes (up to one month)*Number of (doctoral) students participating in short-term programmes* :2016 – 1, 2017 – 2, 2018 – 2, 2019 – 2, 2020 – 2.Long-term programmes*Number of (doctoral) students participating in long-term programmes*:2016 – 2, 2017 – 3, 2018 – 3, 2019 – 3, 2020 – 3. | Shestakova, A.N. |
| 2.3. | Attracting talented prospective students |  |  |  |  |  |  |  |  |
| 2.3.1. | Recruiting prospective foreign students to undergraduate and Master’s programmes  |  |  |  |  |  |  |   |  |
| 2.3.1.1 | Conducting online webinars  |  |  |  | Х | Х | Х | *Number of online webinars held by educational programmes:*2018 – 2, 2019 – 2, 2020 – 2. | Shestakova, A.N. |
| 2.3.1.2. | Creating social media profiles for the STRA-U and its educational programmes |  | Х | Х | Х |  |  | 2016 – preparation of advertising materials2017 - launching social media profiles | Shestakova, A.N. |
| 2.3.1.3. | Internationalizing the School on Neurotechnologies  |  |  |  |  | Х | Х | *Number of foreign participants at the School on Neurotechnologies:*2019 – 5, 2020 – 10. | Klucharev, V.A. Shestakova, A.N.Dragoy, O.V. |
| 2.3.1.4. | Promoting the ‘Cognitive Sciences and Technologies: From Neuron to Cognition ’programme at field-specific conferences and professional portals, in conjunction with École normale supérieure (Paris) on European and North American markets and STRA-U’s research centres on Asian and Latin American markets (India, Iran, etc.) |  | Х | Х | Х | Х | Х | *Number of foreign potentials students who applying to the programme:*2016 –20, 2017 – at least 20, 2018 – at least 20, 2019 – at least 20, 2020 – at least 20. | Shestakova, A.N. |
| 2.3.2 | Recruiting prospective Russian students to undergraduate and Master’s programmes |  |  |  |  |  |  |  |  |
| 2.3.2.1. | Conducting Open Days at laboratories  |  |  | Х | Х | Х | Х | *Number of Open Days’ participants:*2017 – 50, 2018 – 50, 2019 – 50, 2020 – 50. | Klucharev, V.A.Belyanin, A.V.Dragoy O.V.Utochkin, I.S.Shestakova, A.N. |
| 2.3.2.2 | Creating information profiles in Russian social media |  |  | Х |  |  |  | 2017 - launching profiles on Facebook and Vkontakte, developing the programme’s video archive  | Shestakova, A.N. |
| 2.3.2.3 | Conducting popular science events at major city locations (VDNKh, ZIL Cultural Centre, etc.)  |  | Х | Х | Х | Х | Х | *Number of events held at city locations:*2016 – 4, 2017 – 4, 2018 – 4, 2019 – 4, 2020 – 4.*Number of events participants:*2016 – 200, 2017 – 300, 2018 – 300, 2019 – 300, 2020 – 400. | Klucharev, V.A. Belyanin, A.V.Dragoy, O.V.Utochkin, I.S.Shestakova, A.N. |
| 2.3.2.4 | Conducting classes in Neurotechnologies School in partnership with leading neurotechnological companies on a regular basis |  | Х | Х | Х | Х | Х | *Number of participants of School on Neurotechnologies:*2016 – 20, 2017 – 20, 2018 – 20, 2019 – 20, 2020 – 20. | Shestakova, A.N. |
| **3. R&D and Innovation**  |
| 3.1. | Implementing research projects |  |  |  |  |  |  |  |  |
| 3.1.1. | *Project:* (а) Neuroeconomics Models of Decision-Making in Various Social Contexts(b) Prosocial and Antisocial Behavior: Motives, Factors and Applications | Х | Х | Х | Х | Х | Х | *Project focus:* Neuroeconomics Models of Decision-making in Various Social Contexts*Partners* *Universities:* École normale supérieure – Paris, Charité - Universitätsmedizin Berlin*Research organizations:* Neurology Research Centre*Publications:*2016 – 1, 2017 – 2, 2018 – 3, 2019 – 3, 2020 – 3.*Project-related reports at conferences:*2016 – 3, 2017 – 3, 2018 – 3, 2019 – 3, 2020 – 3.*Description* *Main anticipated deliverables*:1. a model for decision-making for groups within the context of social influence. The model will analyze the role of medial prefrontal cortex in building social conformity;
2. a model for financial decision-making under the influence of justice norms;
3. a model for neurobiological mechanisms for subjective valuation of alternatives during decision-making processes;
4. neurotechnologies designed to optimize decision-making processes and create applications for consumer research.

*Project focus:* Prosocial and Antisocial Behavior: Motives, Factors and Applications*Partners* *Universities:* University of Bonn, George Mason University (US)*Research organizations:* Kiel Institute for the World Economy*Companies, organizations:* European Commission*Publications:*2016 – 1, 2017 – 2, 2018 – 2, 2019 – 2, 2020 – 2.*Project-related reports at conferences:*2016 – 3, 2017 – 3, 2018 – 4, 2019 – 4, 2020 – 5.*Description**Main anticipated deliverables*:5. a classification of prosocial and antisocial behaviour motives have been developed and tested during public benefit exercises;6. neurobiological correlates of prosocial and antisocial actions have been investigated;7. cross-country comparisons have been made and a map of motives for representatives of different cultures have been proposed;8. a theoretical model for describing the interrelations between cooperativeness/punishment strategies and ideas, preferences, psychological and neurobiological parameters has been designed;9. variations of punishment motives have been researched based on different game contexts (trust, ultimatum, public benefits). | Shestakova, A.N. Klucharev, V.A.Belyanin, A.V. |
| 3.1.2. | *Project:* Dynamic Brain Connectomics: Algorithms, Paradigms and Tools | Х | Х | Х | Х | Х | Х | *Project focus:* Dynamic Brain Connectomics: Algorithms, Paradigms and Tools*Partner* *Universities:* MEG-Centre of MSUPE*Research organizations:* N. N. Burdenko Neurosurgery Institute*Companies:* LLC NET, LLC Neurobotics*Publications:*2016 – 1, 2017 – 2, 2018 – 3, 2019 – 3, 2020 – 3.*Project-related reports presented at conferences:*2016 – 2, 2017 – 2, 2018 – 2, 2019 – 2, 2020 – 2.*Description**Main anticipated deliverables*:1. a computing engine to provide basis for a new generation of brain mapping software with a particular focus on dynamic networks has been created;2. techniques employed for designing a high-performance computing engine and integrated with existing data processing packages has been applied to analyze functional neural networks responsible for voice functions, selective perception and attention, emotion-based decision-making, diagnosing and pre-surgical mapping of patients;3. the discovered patterns have provided a foundation for a new generation of brain-computer interfaces based on distributed networks’ activity. | Ossadtchi, A.E.Nikulin, V.V. |
| 3.1.3. | *Project:* (а) Statistical Representation of Information in Perception and Visual Memory(b) Preattentive (sensory) and Mnemonic Factors in Controlled Visual Searches | Х | Х | Х | Х | Х | Х | *Project focus:* Statistical Representation of Information in Perception and Visual Memory*Partners* *Universities:* Harvard Medical School (US), University of California San Diego (US), Goldsmiths College (UK)*Publications:*2016 – 2, 2017 – 3, 2018 – 3, 2019 – 3, 2020 – 3.*Project-related reports at conferences:*2016 – 6, 2017 – 5, 2018 – 6, 2019 – 6, 2020 – 7.*Description**Main anticipated deliverables*:1. A theoretical prediction (Utochkin, 2015) of instant categorization of multiple objects based on valuations of the number of peaks in the distribution of their attributes will be experimentally tested;2. A diagnostic method for testing individual differences in terms of the accuracy of visual statistical representations will be developed; this will be useful in further data collection of the links between visual statistics and other visual and non-visual abilities (e.g., at the psychogenic level);3. New data will be obtained on the mechanisms for increasing the volume and accuracy of short-term and long-term visual memory through identifying statistical regularities in memorized material.*Project focus:* Preattentive (Sensory) and Mnemonic Factors in Controlled Visual Search*Partners* *Universities:* Harvard Medical School (US), MIT (US), Brigham & Women’s Hospital (planned)*Publications:*2016 – 1, 2017 – 2, 2018 – 2, 2019 – 2, 2020 – 2.*Project-related reports at conferences:*2016 – 2, 2017 – 2, 2018 – 2, 2019 – 2, 2020 – 2.*Description**Main anticipated deliverables*:1. For the first time, the training effects of effective (very fast) visual searches have been investigated, including increases in speed, so-called ‘search asymmetry’, transfer to other objects, and the occurrence of contrast illusions in response to trained attributes. This will help to answer a fundamental question that could not have been previously determined - whether or not preattentive detectors of ‘complex’ attributes (i.e., an entire object) appear alongside detectors of basic characteristics (e.g., colour, orientation, motion, etc.) during active perception;2. Data has been obtained describing how information on objects and scenes stored in long-term memory is used during repeated memory-managed search across the same scenes;3. A new hypothesis of nature of the so-called ‘illusory connection’ (IC) of visual attributes has been tested. IC refers to erroneous perception (usually through side vision) of objects, consisting of separate parts or attributes of real-life objects that had been previously presented. According to this hypothesis, IC is caused by increased visual deficiency of side vision in terms of attributes’ spatial localization, which, in turn, results in a higher probability of erroneous attachment to the same location of attributes belonging to different places. | Utochkin, I.S. |
|  3.1.4. | *Project:* A Universal ‘Brain-Computer Interface with Biofeedback’ That Can Be Used Individually or by a Group of Individuals | Х | Х | Х | Х | Х | Х | *Project focus:* A Universal ‘Brain-Computer Interface with Biofeedback’ That Can Be Used Individually or by a Group of Individuals*Partners* *Universities:* Lobachevsky University, Duke University Medical Center (planned)*Publications:*2016 – 2, 2017 – 2, 2018 – 2, 2019 – 2, 2020 – 2.*Project-related reports at conferences:*2016 – 2, 2017 – 2, 2018 – 2, 2019 – 2, 2020 – 2.*Description**Main anticipated deliverables*:An all-in-one interface featuring the following components:1. A myoelectric interface for handwriting generation;2. An EEG interface with feedback;3. A multi-channel ECoG interface with feedback;4. An interface for transcranial magnetic stimulation (TMS);5. An interface for electrical brain stimulation.A single interface based on common protocols has been used, which significantly simplifies and accelerates each procedure, thus allowing for the design of hybrid schemes. | Ossadtchi, A.E. |
| 3.1.5. | *Project:* (а) Neuronal Foundations of Language Grammar: Universal Effects and Those Typical of Specific Languages(b) Brain Functions Underlying Speech Disorders | Х | Х |  |  |  |  | *Project focus:* Neuronal Foundations of Language Grammar: Universal Effects and Those Typical of Specific Languages*Partners* *Universities:* [University of Pittsburgh](https://www.google.ru/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0ahUKEwi47ezlgqjQAhXKEywKHaVFDvUQFggcMAA&url=http%3A%2F%2Fwww.pitt.edu%2F&usg=AFQjCNHaZF_ftN0f2CN6qf_9YL3lfO1LaA&sig2=rRsR4EH5xg3IOV9OskivcQ) (USA), Harvard University (planned)*Publications:*2016 – 7.*Project-related reports at conferences:*2016 – 7, 2017 – 7, 2018 – 7, 2019 – 7, 2020 – 7.*Description*The project aims at identifying specific brain mechanisms of speech disorders typical of various diseases, as well as the ways of compensatory reorganization of language functions in the brain.Objective non-invasive methods aimed at assessing cognitive functions (e.g., attention, lexical and semantic memory, etc.) shall be proposed, along with optimal protocols for non-invasive mapping of perception and speech-related neuronal activity, both under normal and pathological conditions (e.g., aphasia), via MEG, fMRI and TMS methods.*Project focus:* Brain Functions Underlying Speech Disorders*Partners* *Universities:* University of Groningen (Netherlands); King’s College London (UK)*Research institutions:* Institute for Advanced Study (Pavia, Italy)*Publications:*2017 – 5, 2018 – 5, 2019 – 5, 2020 – 5.*Project-related reports at conferences:*2016 – 7, 2017 – 7, 2018 – 7, 2019 – 7, 2020 – 7.*Description*1. Main goal of the project: finding correlations between specific speech disorders and lesions of brain structures, along with their integration mechanisms;2. Reorganization of neural substrate-language connection under brain damage conditions;3. Developing strategies for speech disorder rehabilitation. | Dragoy, O.V. |
| 3.1.6. | Applied projects: (а) State contract. Subsidy agreement No. 14.608.21.0001 dated October 14, 2015 between HSE and the Russian Ministry of Education and Science, Federal Targeted Programme ‘R&D in Top Priory Areas of Russian Science and Technology in 2014-2020’. Priority area: Life Sciences (b) System for Registration and Decoding of Bioelectrical Activity in Human Brain and Muscles (SRD-1) | Х | Х |  |  |  |  | *Project focus:* Developing technologies for cortical functions representation in silico*Partners:* Lobachevsky University, Institute of Applied Physics of the Russian Academy of Sciences*Intellectual property items:* 3*Publications*2016 – 3 *Project-related reports at conferences*2016 – 2 *Description*1. Main goal of the project: developing a mathematical model for signal processing in neurons and glial cells (astrocytes);
2. Developing experimental software for computer simulation of neural activity in extra-large neuronal-glial networks of cortical brain structures.

*Project focus:* system for registration and decoding of bioelectrical activity in the human brain and muscles (SRD-1)*Partner:* Lobachevsky University*Project deliverables*2016 – software for a multi-room ideomotor interface*Description*The project intends to develop and analyze experimental hardware and software system (SRD-1) designed to register human bioelectric activity signals and interpret them into control signals. | Gutkin, B.S.Ossadtchi, A.E. |
| 3.1.7. | Developing applied R&D, participating in Russian Science Foundation grants  | Х | Х | Х | Х | Х | Х | RUB 138 mln in 2017-2020, including:- Russian Science Foundation grants. Focus: cognitive neurobiology (neuroeconomics, psycholinguistics, cognitive processes);and/orState contracts under the Federal Targeted Programme, contracts for applied R&D. Focus: neurotechnologies (optimization and modeling of brain activities under normal and pathological conditions). | Shestakova, A.N.Belyanin, A.V/Dragoy, O.V.Utochkin, I.S. |
| 3.2. | Conducting academic events |  |  |  |  |  |  |  |  |
| 3.2.1. | Organizing and conducting conferences |  |  |  |  |  |  |  |  |
| 3.2.1.1 | Organizing and conducting large-scale international conferences with global specialists and experts’ participation in the STRA-U’s areas of focus  |  | Х | Х | Х | Х | Х | Organizing and conducting the international conference ‘Cognition, Computation, Communication and Perception’ (at least once a year)*Number of participants/international participants of the event:*2016 – 50/10, 2017 – 50/10, 2018 – 50/10, 2019 – 50/10, 2020 – 50/10.Assisting in the organization and holding of large-scale international conferences (panels and sessions dedicated to the STRA-U’s areas of focus) *Number of international conferences (panels and sessions dedicated to the STRA-U’s areas of focus) organized and held with the involvement of the STRA-U’s staff:*2016 – 2, 2017 – 3, 2018 – 3, 2019 3, 2020 – 4.Organizing and holding summer schools with international participants (at least once a year)*Number of participants/international participants of the event (at least):*2016 – 60/20, 2017 – 60/20, 2018 – 60/20, 2019 – 100/50 2020 – 100/50.Organizing, holding and participating in international seminars dedicated to the STRA-U’s areas of focus *Number of participants/international participants of the event*:2016 – 520/130, 2017 – 600/150, 2018 – 600/150, 2019 – 600/150, 2020 – 600/150. | Klucharev, V.A. Belyanin, A.VDragoy, O.V.Utochkin, I.S.Shestakova, A.N. |
| 3.2.2. | Holding research seminars, expert seminars/working groups on a regular basis  |  |  |  |  |  |  |  |  |
| 3.2.2.1 | Developing a regular seminar with leading global researchers and experts’ participation | Х | Х | Х | Х | Х | Х | *Number of participants/international participants of the event:* 2017 – 70/30, 2018 – 70/30, 2019 – 70/30, 2020 – 70/30.*Number of invited international experts:*2016 – 26, 2017 – 30, 2018 – 30, 2019 - 30, 2020 – 40. | Klucharev, V.A. Belyanin, A.V.Dragoy, O.V.Utochkin, I.S.Shestakova, A.N. |
| 3.3. | Support for publishing activities |  |  |  |  |  |  |  |  |
| 3.3.1. | Publishing pre-prints in English  |  |  |  |  |  |  |  |  |
| 3.3.1.1 | Focus: economics and psychology  |  |  |  |  |  |  | *Number of preprints published in English:*2016 – 5, 2017 – 5, 2018 – 5, 2019 – 5, 2020 – 5. | Klucharev, V.A. Belyanin, A.V.Dragoy, O.V.Utochkin, I.S.Shestakova, A.N. |
| 3.3.2. | The STRA-U’s staff shall join the editorial boards of leading international journals dedicated to the unit’s areas of focus | Х | Х | Х | Х | Х | Х | *Number of employees working in editorial boards of the leading journals:* 2016 – 6, 2017 – 6, 2018 – 6, 2019 – 6 TBD, 2020 – 6 TBD. | Klucharev, V.A. Belyanin, A.V.Dragoy, O.V.Utochkin, I.S.Shestakova, A.N. |
| 3.4 | Regular expert review of the STRA-U’s research outcomes by the international advisory council |  |  | Х | Х | Х | Х | Expert review of STRA-U’s research projects reports Meeting minutes of the international advisory council (including evaluations and recommendations) | Shtyrov, Y.Y. |
| 3.5. | Designing information platform for inter-faculty projects at HSE  |  |  |  | Х | Х | Х | Proposing an algorithm for launching inter-faculty (interdisciplinary) projects and creating a webpage for sharing information on these projects with HSE’s employees; Developing a series of inter-faculty seminars. | Klucharev, V.A. |
| **4. HR Policy** |
| 4.1. | Hiring academic staff (instructors and researchers) on the global academic market  |  |  |  |  |  |  |  |  |
| 4.1.1. | Hiring academic staff (instructors and researchers) from the global academic market  |  | Х | Х | Х | Х | Х | *Number of academic staff members (instructors and researchers) hired from the global academic market:*2016 – 3, 2017 – 3, 2018 – 4, 2019 – 4, 2020 – 4. | Klucharev, V.A.Belyanin, A.V.Dragoy, O.V.Utochkin, I.S.Shestakova, A.N. |
| 4.2 | Attracting instructors and researchers from leading field-specific centres, as well as real sector practitioners, to teach courses and participate in joint educational programmes  |  | Х | Х | Х | Х | Х | *Number of academic staff members (instructors and researchers) hired from the global academic market:*2016 – 3, 2017 – 3, 2018 – 4, 2019– 4, 2020 – 5. | Klucharev, V.A. Belyanin, A.V.Dragoy, O.V.Utochkin, I.S.Shestakova, A.N. |
| 4.2.1. | Educational programme ‘Cognitive Sciences and Technologies: From Neuron to Cognition’Markets: Goldsmiths, University of London, MEG-Centre of MSUPE, Ecole normale supérieure (Paris) Institute for Advanced Studies (Pavia, Italy) |  | Х | Х | Х | Х | Х | *Number of instructors hired to deliver courses and lead research seminars, including international staff:*2016 – 1, 2017 – 2, 2018 – 3, 2019 – 3, 2020 – 3.*Number of courses delivered by invited instructors and researchers from leading field-specific centres and experts from the real sector of the economy:*2016 – 1, 2017 – 2, 2018 – 2, 2019 – 2, 2020 – 2. | Belyanin, A.V.Dragoy, O.V.Utochkin, I.S.Shestakova, A.N. |
| 4.2.2. | Engaging business representatives in the work of academic councils of the STRA-U and its educational programmes  |  |  |  |  |  | Х | *Number of business representatives on academic councils of educational programmes:*2020 – 2. | Belyanin, A.V.Dragoy, O.V.Utochkin, I.S.Shestakova, A.N. |
| 4.3. | Attracting experts from leading field-specific centres and experts from the real sector to implement research projects  |  |  |  |  |  |  |  |  |
| 4.3.1. | *Project:* Neuroeconomics Models of Decision-making in Various Social Contexts Market: neurotechnology |  |  | Х | Х | Х | Х | *Number of experts from leading field-specific centres and experts from the real sector of the economy (including international staff) engaged in the implementation of research projects:*2017 – 1, 2018 – 1, 2019 – 1, 2020 – 1. | Shestakova, A.N. |
| 4.3.2. | *Project:* Dynamic Brain Connectomics: Algorithms, Paradigms and ToolsMarket: neurotechnology |  |  | Х | Х | Х | Х | *Number of experts from leading field-specific centres and experts from the real sector of the economy (including international staff) engaged in the implementation of research projects:*2016 – 1, 2017 – 1, 2018 – 1, 2019 – 1, 2020 – 1. | Shestakova, A.N. |
| 4.3.3. | *Project:* Statistical Representation of Information in Perception and Visual MemoryMarkets: Harvard Medical School, USA (H.Y. Im), University of California San Diego, USA (T. Brady), Goldsmiths College, UK (Y. Kovas, M. Tosto) |  | Х | Х | Х | Х | Х | *Number of experts from leading field-specific centres and experts from the real sector of the economy (including international staff) engaged in the implementation of research projects:*2016 – 1, 2017 –, 2018 – 3, 2019 – 2, 2020 – 2. | Utochkin, I.S. |
| 4.3.4. | *Project:* Preattentive (sensory) and mnemonic factors in controlled visual searchMarkets: Brigham & Women’s Hospital, Harvard Medical School, USA (J. Wolfe), Massachusetts Institute of Technology, USA (R. Rosenholtz) |  | Х | Х | Х | Х | Х | *Number of experts from leading field-specific centres and experts from the real sector of the economy (including international staff) engaged in the implementation of research projects:*2016 – 1, 2017 – 2, 2018 – 2, 2019 – 2, 2020 – 1. | Utochkin, I.S. |
| 4.3.5. | *Project:* Neuronal Foundations of Language Grammar: Universal Effects and Those Typical of Specific LanguagesMarkets: Centre for Speech Disorders and Neurorehabilitation  | Х | Х |  |  |  |  | *Number of experts from leading field-specific centres and experts from the real sector of the economy (including international staff) engaged in the implementation of research projects:*2016 – 1. | Dragoy, O.V. |
| 4.3.6. | *Project:* Brain Functions Underlying Speech DisordersMarkets:Centre for Speech Disorders and Neurorehabilitation*,* N. N. Burdenko Neurosurgery Institute*,* ‘Epilepsy’ CentreMarket: neurotechnology sector |  |  | Х | Х | Х | Х | *Number of experts from leading field-specific centres and experts from the real sector of the economy (including international staff) engaged in the implementation of research projects:*2017 – 3, 2018 – 3, 2019 – 3, 2020 – 3. | Dragoy, O.V. |
| 4.4. | Developing postdoc programmes |  |  |  |  |  |  |  |  |
| 4.4.1 | Hiring postdocs from the global labour market | Х | Х | Х | Х | Х | Х | *Number of postdocs hired:*2016 –5, 2017 – 7, 2018 – 6, 2019 – 6, 2020 – 6. | Klucharev, V.A. Belyanin, A.V.Dragoy, O.V.Utochkin, I.S.Shestakova, A.N. |
| 4.5. | Outgoing mobility of academic staff members (instructors and researchers)  |  |  |  |  |  |  |  |  |
| 4.5.1 | Under agreements with: |  |  |  |  |  |  |  |  |
| 4.5.1.1 | Ecole normale superieure ParisPurpose: continuing professional development (CPD) for staff and joint projects in theoretical neurobiology  |  | Х | Х | Х | Х | Х | Long-term mobility*Number of employees participating in long-term mobility programmes:*2016 – 1, 2017 – 1, 2018 – 1, 2019 – 1, 2020 – 1. | Klucharev, V.A. Belyanin, A.V.Dragoy, O.V.Utochkin, I.S.Shestakova, A.N. |
| 4.5.1.2 | Aalto UniversityPurpose: CPD for staff and joint projects in neurotechnologies |  | Х | Х | Х | Х | Х | Long-term mobility*Number of employees participating in long-term mobility programmes*:2016 – 1, 2017 – 1, 2018 – 1, 2019 – 1, 2020 – 1. | Klucharev, V.A. Belyanin, A.V.Dragoy, O.V.Utochkin, I.S.Shestakova, A.N. |
| 4.5.1.3 | Center for Aphasia and Related Disorders (US)Purpose: CPD for staff and joint projects in neurolinguistics  |  | Х | Х | Х | Х | Х | Long-term mobility*Number of employees participating in long-term mobility programmes:* 2016 – 1, 2017 – 1, 2018 – 1, 2019 – 1, 2020 – 1. | Klucharev, V.A. Belyanin, A.V.Dragoy, O.V.Utochkin, I.S.Shestakova, A.N. |
| 4.5.1.4 | King’s College LondonPurpose: CPD for staff and joint projects in neurolinguistics |  | Х | Х | Х | Х | Х | Long-term mobility*Number of employees participating in long-term mobility programmes*:2016 – 0, 2017 – 1, 2018 –1, 2019 – 1, 2020 – 1. | Klucharev, V.A. Belyanin, A.V.Dragoy, O.V.Utochkin, I.S.Shestakova, A.N. |
| 4.5.1.5 | University of California San Diego Brigham & Harvard Medical School & Women’s Hospital (planned)Purpose: CPD for staff and joint projects in neurolinguistics |  | Х | Х | Х | Х | Х | Long-term mobility*Number of employees participating in long-term mobility programmes*:2016 – 1, 2017 – 0, 2018 – 1, 2019 – 1, 2020– 1. | Klucharev, V.A.Belyanin, A.V.Dragoy, O.V.Utochkin, I.S.Shestakova, A.N. |
| 4.6. | Incoming academic mobility for participation in academic and research activities  |  |  |  |  |  |  |  |  |
| 4.6.1. | Inviting professors and research fellows to deliver lectures and conduct research Markets: Goldsmiths, University of London, MEG-Centre of MSUPE, Ecole normale superieure Paris, Northern California Health Care System, Vita-Salute San Raffaele University, George Mason University, etc. | X | X | X | X | X | X | *Number of professors and research fellows invited to deliver lectures and conduct research:* 2016 – 8, 2017 – 13, 2018 – 7, 2019 – 10, 2020 – 10. | Klucharev, V.A.Belyanin, A.V.Dragoy, O.V.Utochkin, I.S.Shestakova, A.N. |
|  | Implementing CPD programmes for academic staff |  |  |  |  |  |  |  | Klucharev, V.A.Belyanin, A.V.Dragoy, O.V.Utochkin, I.S.Shestakova, A.N. |
| 4.7.1. | CPD programmes for academic staff  |  |  |  |  |  |  | *Number of academic staff members who have completed a CPD programme:*2016 – 55, 2017 – 60, 2018– 60, 2019 – 60, 2020 – 80. | Klucharev, V.A.Belyanin, A.V.Dragoy, O.V.Utochkin, I.S.Shestakova, A.N. |

\* - results of project implementation are approximate and may be adjusted in light of external and internal organizational developments.