# EGE BINGSS

Ege Biennial International Neuroscience Graduate Summer School

## Trends in Neurosciences:
*Bridging new techniques with indispensables*


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## MEETING PROGRAM and ABSTRACTS

# EGE BINGSS

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**Assoc. Prof. Dr. Vedat Evren**

**Prof. Dr. Gülgün Şengül**

**Prof. Dr. Bayram Yılmaz**

**Prof. Dr. Arzu Aral**

**Prof. Dr. Emel Ulupınar**

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Assist. Prof. Dr. Robert Ian Bowers
Assist. Prof. Ausaf Farooqui
Dr. Yavuz Yavuz
Dr. Yasin Kaymaz

# 8th
# EGE BINGSS PROGRAM

# JUNE 27

| | | |
|---|---|---|
| 10:00 – 10:30 | Opening Ceremony & Orientation | Prof. Dr. Necdet Budak<br>Prof. Dr. Cemil Gürgün<br>Prof. Dr. Gönül Peker<br>Prof. Dr. Bayram Yılmaz<br>Assoc. Prof. Dr. Vedat Evren |
| 10:30 – 11:15 | Basic Anatomy and Development of the Spinal Cord and Brain | Prof. Dr. Emel Ulupınar<br>Prof. Dr. Gülgün Şengül |
| **11:15 – 11:45** | **Coffee Break** | |
| 11:45 – 12:30 | Basic Histology & Cell Biology of Neurons and Glias | Prof. Dr. Emel Ulupınar<br>Prof. Dr. Gülgün Şengül<br>Assoc. Prof. Dr. Özlem Yılmaz |
| **12:30 – 13:30** | **LUNCH** | |
| 13:30 – 14:15 | Biophysical effects of Immunoglobulin G in Amyotrophic Lateral Sclerosis – “from basic studies to biomedical devices” *** | Prof. Dr. Pavle Andjus |
| 14:15 - 15:00 | Neuroimaging Methods for Understanding Human Brain Function | Assist. Prof. Dr. Burcu Ayşen Ürgen |
| **15:00 – 15:30** | **Coffee Break** | |
| 15:30 – 16:15 | Multiple modes of intra and inter cellular communications, including neurons | Prof. Dr. Yannis F. Missirlis |
| 16:15 - 17:00 | Electrophysiological recording using “Patch Clamp” method | Dr. Yavuz Yavuz |
| 17:00 – 18:00 | Neuroscience: History & Ethics *** | Prof. Dr. Robert Rubin |
| **19:30 – 23:00** | **Opening Reception Coctail Prolongé** | |

# JUNE 28

| | | |
|---|---|---|
| 09:00 – 09:45 | 3D Cell Culture Techniques | Assoc. Prof. Dr. Aylin Şendemir |
| **09:45 – 10:15** | **Coffee Break** | |
| 10:15 – 12:00 | **WET LAB** (Mandatory for Everyone): CENTRAL NERVOUS SYSTEM ANATOMY | Prof. Dr. Emel Ulupınar<br>Prof. Dr. Gülgün Şengül<br>Prof. Dr. Hülya Üçerler<br>Prof. Dr. Meltem Bahçelioğlu<br>Assoc. Prof. Dr. Özlem Yılmaz |
| **12:00 – 13:00** | **LUNCH** | |
| 13:00 – 15:00 | **WET LAB (A):** 3D CELL CULTURE - DAY(1) | Assoc. Prof. Dr. Aylin Şendemir<br>Prof. Dr. Arzu Aral |
| 13:00 – 15:00 | **WET LAB (B):** ELECTROPHYSIOLOGY and CURRENT TECHNIQUES - DAY(1) | Assoc. Prof. Dr. Vedat Evren<br>Dr. Yavuz Yavuz |
| 13:00 – 15:00 | **WET LAB (C):** ANIMAL MODELS for NEURODEGENERATIVE DISEASES - DAY(1) | Assist. Prof. Dr. Güven Akçay |
| **15:00 – 15:30** | **Coffee Break & Return to the Venue** | |
| 15:30 – 17:30 | **SIG – A (*Special Interest Group*):** MIND & CONCEPT MAPPING | Prof. Dr. Gönül Peker<br>Prof. Dr. Arzu Aral |
| 15:30 – 17:30 | **SIG – B (*Special Interest Group*):** BIOINFORMATICS | Dr. Yasin Kaymaz |
| 15:30 – 17:30 | **SIG – C (*Special Interest Group*):** PATTERN ANALYSIS METHODS in NEUROSCIENCE | Assist. Prof. Dr. Burcu Ayşen Ürgen<br>Assist. Prof. Ausaf Farooqui |
| 18:00 – 19:30 | **INTERACTIVE TRAINING:** The ABC of Research Project Writing | Prof. Dr. Ferhan Sağın |
| | **Dinner on your own** | |

# JUNE 29

| | | |
|---|---|---|
| 09:00 – 09:45 | Use of Optogenetic and Chemogenetic Methods in Transgenic Mouse Models | Prof. Dr. Bayram Yılmaz |
| 09:45 - 10:30 | The place and importance of virally mediated gene transfer technology in neuroscience studies | Prof. Dr. Emel Ulupınar |
| **10:30 – 11:00** | **Coffee Break** | |
| 11:00 – 11:45 | Virtual Reality and Human Behavioral Responses Measurement | Assoc. Prof. Dr. Hale Yapıcı Eser |
| 11:45 - 12:30 | Studying transgenic animals in Multiple Sclerosis Research: Ablation of Pericytes | Prof. Dr. Yasemin Gürsoy Özdemir |
| **12:30 – 13:30** | **LUNCH** | |
| 13:30 – 15:30 | **WET LAB (A):** 3D CELL CULTURE - DAY(2) | Assoc. Prof. Dr. Aylin Şendemir<br>Prof. Dr. Arzu Aral |
| 13:30 – 15:30 | **WET LAB (B):** ELECTROPHYSIOLOGY and CURRENT TECHNIQUES - DAY(2) | Assoc. Prof. Dr. Vedat Evren<br>Dr. Yavuz Yavuz |
| 13:00 – 15:00 | **WET LAB (C):** ANIMAL MODELS for NEURODEGENERATIVE DISEASES - DAY(2) | Assist. Prof. Dr. Güven Akçay |
| **15:30 – 16:00** | **Coffee Break & Return to the Venue** | |
| 16:00 – 18:00 | **SIG – A (*Special Interest Group*):** MIND & CONCEPT MAPPING | Prof. Dr. Gönül Peker<br>Prof. Dr. Arzu Aral |
| 16:00 – 18:00 | **SIG – B (*Special Interest Group*):** BIOINFORMATICS | Dr. Yasin Kaymaz |
| 16:00 – 18:00 | **SIG – C (*Special Interest Group*):** PATTERN ANALYSIS METHODS in NEUROSCIENCE | Assist. Prof. Dr. Burcu Ayşen Ürgen<br>Assist. Prof. Ausaf Farooqui |
| **18:00 – 18:15** | **Coffee Break** | |
| 18:15 - 19:00 | Your brain in Metaverse *** | Prof. Dr. Banu Onaral |
| | **Dinner on your own** | |

# JUNE 30

| | | |
|---|---|---|
| 09:00 – 09:45 | How fMRI studies has changed our approach to our understanding of brain functions in Psychiatry? | Prof. Dr. Ali Saffet Gönül |
| 09:45 - 10:30 | Neuromodulation with transcutaneous vagus nerve stimulation, best practices and pitfalls | Assist. Prof. Maria Veldhuizen |
| **10:30 – 11:00** | **Coffee Break** | |
| 11:00 – 11:45 | Exosomes on neurological field: Where we are *** | Assoc. Prof. Dr. Barbara Zavan |
| 11:45 - 12:30 | Basics and molecular imaging technics of neuroinflammation | Prof. Dr. Arzu Aral |
| **12:30 – 13:30** | **LUNCH** | |
| 13:30 – 15:30 | **WET LAB (A):** 3D CELL CULTURE - DAY(3) | Assoc. Prof. Dr. Aylin Şendemir<br>Prof. Dr. Arzu Aral |
| 13:30 – 15:30 | **WET LAB (B):** ELECTROPHYSIOLOGY and CURRENT TECHNIQUES - DAY(3) | Assoc. Prof. Dr. Vedat Evren<br>Dr. Yavuz Yavuz |
| 13:30 – 15:30 | **WET LAB (C):** ANIMAL MODELS for NEURODEGENERATIVE DISEASES - DAY(3) | Assist. Prof. Dr. Güven Akçay |
| **15:30 – 16:00** | **Coffee Break & Return to the Venue** | |
| 16:00 – 18:00 | **SIG – A (*Special Interest Group*):** MIND & CONCEPT MAPPING | Prof. Dr. Gönül Peker<br>Prof. Dr. Arzu Aral |
| 16:00 – 18:00 | **SIG – B (*Special Interest Group*):** BIOINFORMATICS | Dr. Yasin Kaymaz |
| 16:00 – 18:00 | **SIG – C (*Special Interest Group*):** PATTERN ANALYSIS METHODS in NEUROSCIENCE | Assist. Prof. Dr. Burcu Ayşen Ürgen<br>Assist. Prof. Ausaf Farooqui |
| 18:00 – 19:30 | **INTERACTIVE TRAINING:** How to Make an Effective Oral Presentation | Prof. Dr. Ferhan Sağın |
| **19:30 - 24:00** | **GALA DINNER** | Buenas |

# JULY 1

| | | |
|---|---|---|
| 08:30 - 09:00 | What IBRO offers for young neuroscientists: scholarships, trainings, courses and beyond | Prof. Dr. Gülgün Şengül |
| 09:00 - 09:45 | Modelling systems of behaviour | Assist. Prof. Dr. Robert Ian Bowers |
| 09:45 - 10:30 | What psychology can learn from neurology? | Assist. Prof. Ausaf Farooqui |
| **10:30 – 11:00** | **Coffee Break** | |
| 11:00 – 11:45 | Neuroscience, Digital Technologies and Artificial Intelligence: A Troublesome Gathering for Humanity? | Assoc. Prof. Dr. Cengiz Acartürk |
| 11:45 - 12:30 | Closing Ceremony | |
| 14:00 - 19:00 | **İzmir City Tour** | |

# 8th
# EGE BINGSS ABSTRACTS

**Multiparametric Evaluation of Functional Outcomes in Stroke Patients Using Connectomics**

Esin Avci, Gitta Rohweder, Axel Sandvig, Ioanna Sandvig

Norwegian University of Science and Technology, Norway

Abstract

Despite technological advances in medicine, stroke is still one of the leading causes of disability worldwide. The underlying physiology, extent of changes in neural network and recovery patterns are not fully understood. This ongoing longitudinal clinical study aims to provide a connectomics perspective on stroke recovery using multimodal quantitative tools to assess the rewiring of the functional and structural network and the correlates of motor function improvement. The study sample includes 25 ischemic and hemorrhagic stroke patients with upper extremity motor deficits, examined within 5 days, at 1 month and at 3 months after stroke onset. The control group consists of 25 age- and gender-matched healthy subjects.

To quantify the surviving neural network, we use advanced high-resolution 7T MRI neuroimaging and 64-channel EEG. fMRI and DTI are used to estimate lesion volume and remaining nerve fiber connections. EEG is applied to assess cortical activation patterns. Degree of motor function damage and restoration are quantified via kinematic tools with 3D motion capture systems and EMG. Blood samples are collected to examine pro and anti-inflammatory responses and the regulation of specific micro RNA transcriptional factors.

Data will be stratified based on age, lesion volume and surviving neural network. We aim to provide links between biomarkers, functional motor outcomes and connectivity states to demonstrate adaptive or maladaptive responses. We endeavor to explain how neural network responses to stroke-induced changes and are modulated with restored motor function. With this knowledge, better rehabilitation strategies can be developed to maximize recovery for individual stroke patients.

For details see : https://clinicaltrials.gov/ct2/show/NCT05086055

**Chronic Neuroinflammation Suppresses Hippocampal Neurogenesis**

Gunel Ayyubova, Sadigi Ilaha, Eyyubova Nazrin, Huseynova Shahla, Yildirim Leyla, Gurbanova Shahane

Azerbaijan Medical University, Department of Cytology, Embryology, and Histology, Azerbaijan

Abstract

Introduction. Adult neurogenesis plays an important role in memory and learning, and impaired neurogenesis results in many cognitive and mood disorders [1,2]. A number of long-term diseases of the peripheral organs and metabolic disorders, as well as normal aging cause chronic peripheral inflammatory reactions. Since there is no information on neurogenesis in humans in the setting of chronic peripheral inflammatory diseases, we aimed to investigate the effect of long-term neuroinflammation on the formation of new neurons in the animal model by immunohistochemical methods using doublecortin and thymidine analogues. Materials and methods. The object of study was 30 male mice that have been divided into 2 groups, control and experimental. The experimental animals have received intraperitoneal injections of E.coli lipopolysaccharide (LPS 055:B5; Sigma – Aldrich, St. Louis, USA) at a dose of 750 μq/kg for 7 consecutive days. Two weeks later, i/p injections of 5'-bromodeoxyuridine (BrdU)/5 days have been done in both groups. The animals were sacrificed 5 weeks after the first LPS injection. Results. Increased levels of inflammatory cytokines - IL-1, TNFα, IL-6, IL-18 in the hippocampus of experimental animals have indicated the ongoing inflammatory process. Using stereological methods we investigated the distribution and density of newly formed neurons expressing BrdU and Doublecortin in the hippocampal subgranular and granular zones. The number of newly formed neurons stained with doublecortin in consecutive brain sections in the septotemporal direction was significantly decreased compared to the control group (p)

1. de Miranda AS, Zhang CJ, Katsumoto A, Teixeira AL.Hippocampal adult neurogenesis: Does the immune system matter? J Neurol Sci. 2017 Jan 15;372:482-495. doi: 10.1016/j.jns.2016.10.052. Epub 2016 Nov 3

2. Kase, Y., Shimazaki, T. & Okano, H. Current understanding of adult neurogenesis in the mammalian brain: how does adult neurogenesis decrease with age?. Inflamm Regener 40, 10 (2020). https://doi.org/10.1186/s41232-020-00122-x

# Is Experience In Photography Related Eye Tracker Results In Watching Art Photographs?

Kazim Hilmi Or
Private Office of Ophthalmology. Istanbul, Turkey

Abstract

**Area of interest**: Eye trackers can show eye fixations and their durations in AOI (area of interest). The aim of the study is to find the difference in fixated attention areas in eye tracker results in different photography experience level groups.

**Basic assumptions**: The AOI scores are expected to be different in the experienced photographers group in relation to less experienced or unexperienced groups.

**Methods**: Tobii Pro X2-60 eye tracker measurements were made during watching 10 photography contest photographs. The study groups were doyens and academicians of photography as the experienced group and photography students as less experienced group. Control groups were two groups with same in the same level educated people in the same age as in the first two groups without any special interest in photography. Ten photographs about “Istanbul” were shown to the subjects in a row each for five seconds. The viewers had been given the instruction to decide whether the photograph should be eliminated or not. The eye movements at the judging period were recorded with the eye tracker. Area of interest (AOI) areas are determined and compared between the groups.

**Results**: There were no statistically significant AOI fixation differences between the study and control groups in all photographs except in one. Photography doyans were significantly quicker in negative decisions than in positive. The decision making took slightly longer in lower experience groups.

**Conclusion**: The eye tracking results in watching photographs seem to be similar in different photography experience levels.

For details see : Or, Kazım Hilmi. “Interaction of visual perception with viewing of photos”. Thesis for Proficiency in Arts: equivalent to the PhD in Art). Mimar Sinan University of Fine Arts. Institute of Fine Arts). Istanbul. Turkey. 2017.

# Investigatıon Of The Effects Of Kolliphor On Caspase-3 Enzyme Expression In Pc-12 Cells

Melih Dagdeviren
Ege University, Faculty of Science, Department of Biology, İzmir, Turkey

Abstract

Kolliphor is the polyethoxylated form of castor oil that is also used in food and cosmetics. Kolliphor is used as a solvent and vehicle agent for many water-insoluble, oil-soluble drugs. In addition, it is known that kolliphor is toxic on its own. PC-12 cells are a valuable model for mimicking nerve cell toxicity with their ability to form neuron-like cells. PC-12 cells were grown in complete medium containing RPMI-1640 and 10% HS, 5% FBS, 1% antibiotics. Kolliphor was administered in solution at varying doses (0.01%; 0.02%; 0.05% v/v). Cells were cultured in 96-well culture plates for 24 and 48 hours. Cells were seeded at 10000 cells per well. The same volume of sterile water with the chemical was applied to the control group. Total mRNA was isolated from cells passaged under the same conditions and the expressions of β-Actin and caspase-3 genes were analyzed by qRT-PCR. An increase in caspase-3 expression (a marker of apoptosis) was detected with the administration of 0.05% v/v kolliphor for 48 hours. In conclusion, it can be said that increasing doses of kolliphor application are toxic to PC-12 cells and lead the cells to controlled death by apoptosis at the end of 48 hours.

# Evaluation of Functional Movement Parameters of Parkinson's Patients During On and Off States of Dopaminergic Medication

İsmail Bayram, Jonathan Lyon Jacob Lommen
Independent Researcher, School of Human Kinetics, Faculty of Health Sciences, University of Ottawa, Ottawa, Canada

Abstract

Introduction and Aim: Parkinson's Disease (PD) is a progressive neurodegenerative disease affecting sensory-motor systems and badly decreasing patients' quality of life. To control its symptoms, patients are on a personalized dosage of medication, which could be used by the neurological specialist in the clinic for a standardized evaluation [1]. Although the patients and their symptoms are analyzed thoroughly, the symptoms can present themselves differently at the assessment in the clinic than in the patients' daily life. Additionally, not all patients can communicate the severity of their symptoms to the specialist, resulting in suboptimal control of the disease [2]. The Psychology, Health and Technology department started a research project in the E-Health house at the University of Twente measuring patients' functional movements during a full day and launched a challenge. This project aims to find a method to detect characteristic features of the patients with Parkinson's and compare those between the ON and OFF periods.
Methods: The data analyzed in this challenge was provided by the Xsens (now Movella) company. The data belongs to 3 unanimous patients and the content is not the same for all 3 patients since they were unable to perform the same movement patterns due to disease severity. Their descriptive information such as age, height, weight, and laterality has not been provided to keep them unanimous. Tremor, gait and balance assessments were asked to be performed via preferred approaches and methods.
Results: Our team detected some improvements in gait parameters such as cadence (step/min), number of steps, speed (m/s), total distance (m), stride and length. For tremor assessment, we created a heat map based on the magnitude and frequency of the tremors.
Conclusion: Provided data shows that PD patients are having some difficulties during turns and initiation of gait (freezing gait). It accompanies a delay in the first step at the beginning of the gait and after turns as well. Most of the parameters show a difference between the ON and OFF periods for the patients indicating an improvement in gait during the ON period.

1. Nonnekes, Timmer, M. H., de Vries, N. M., Rascol, O., Helmich, R. C., & Bloem, B. R. (2016). Unmasking levodopa resistance in Parkinson's disease. Mov Disord, 31(11), 1602-1609. doi:10.1002/mds.26712
2. Kalia, L. V., & Lang, A. E. (2015). Parkinson's disease. The Lancet, 386(9996), 896-912. doi:10.1016/s0140-6736(14)61393-3

**Investigation of SUMOylation and Phosphorylation on Pea3**

Mehmet Alp Güner, Başak Kandemir
Baskent University, Ankara, Turkey

Abstract

Pea3/ETV4, Erm/ETV5, and Er81/ETV1 are all members of the ETS domain transcription factors superfamily. PEA3 proteins are also required for neuronal differentiation. The MAPK/ERK signaling pathway regulates members of the PEA3 family and it has also been demonstrated to undergo post-transcriptional changes such as phosphorylation and SUMOylation. However, while the exact sequences required for these alterations have been identified for Erm and Er81, the specific regions required for Pea3 remain unknown. However, whereas the specific regions required for these alterations have been identified for Erm and Er81, the specific regions required for Pea3 remain unknown. We previously demonstrated that the Serine 90 motif is critical for Pea3 axon extension and guidance in neuronal cells. Other investigations have discovered that phosphorylation and SUMOylation can be used to regulate Pea3 stability. The aim of this study is to investigate the interplay of phosphorylation and SUMOylation of Pea3. For this, Pea3 phospho-mutants were expressed in NSC-34 cell lines and then, SUMOylation was analyzed with Global Protein SUMOylation assay kit. We examined the implications of the newly discovered phosphorylation locations on SUMOylation. This research is expected to reveal a key biochemical mechanism for axon extension and neuron regeneration.

1.Bojovic BB, Hassell JA. The transactivation function of the Pea3 subfamily Ets transcription factors is regulated by Sumoylation. DNA Cell Biol 2008; 27(6): 289 – 305.
2.Guo B, Sharrocks AD. Extracellular signal-regulated kinase Mitogen-activated protein kinase signaling initiates a dynamic interplay between sumoylation and ubiquitination to regulate the activity of the transcriptional activator Pea3. Mol Cell Biol 2009; 29(11): 3204 – 3218.
3.Kandemir, B., Caglayan, B., Hausott, B., Erdogan, B., Dag, U., Demir, O., Sogut, M. S., Klimaschewski, L., & Kurnaz, I. A. (2014). Pea3 transcription factor promotes neurite outgrowth. Frontiers in molecular neuroscience, 7, 59.
4.Oh S, Shin S, Janknecht R. ETV1, 4 and 5: an oncogenic subfamily of ETS transcription factors. Biochim Biophys Acta 2012; 1826(1): 1 – 12.
5.Polleux F., Ince-Dunn G., Ghosh A. (2007). Transcriptional regulation of vertebrate axon guidance and synapse formation. Nat. Rev. Neurosci. 8 331–340

# The Effect Of Epoch Length On The Classification Of Schizophrenia Using Machine Learning And Deep Learning Techniques Via EEG Signals

Çağın Çevik, Rüveyda Halıcı
SANKARA Brain and Biotechnology Research Center, Entertech Technocity, Avcilar, Istanbul, Turkey Department of Computer Engineering, Computer and Informatics Faculty, University of Sakarya, Sakarya, Turkey

Abstract

Schizophrenia is a serious mental disorder that currently affects approximately 21 million people worldwide. Detection of mental disorders such as schizophrenia by analysis of electroencephalography (EEG) signals is promising for neuroscience studies. In this study, we used EEG signals for diagnosing schizophrenia through machine learning algorithms and deep learning based method. We compared the accuracy results of the different methods with each other. In addition, the effects of the EEG epoch value on the methods are examined. EEG signals from 14 healthy subjects and 14 schizophrenic patients were collected by the Institute of Psychiatry and Neurology in Warsaw, Poland. Firstly, EEG signals were divided into 25 second time frames and used. As conventional machine learning methods, support vector machine, k-nearest neighbors, decision tree and logistic regression models were used to classify EEG signals. We extracted various microstate features from the resting-state EEG recordings of subjects including conventional EEG characteristics, statistical and frequency characteristics. Also, one-dimensional convolutional networks (1D-CNNs) were used. In this architecture, the ReLU activation function was used. The k-fold cross-validation method with k = 5 has been used on dataset. 1D-CNNs model has achieved an accuracy percentage of 80.33%, better than the results of used conventional machine learning methods. In the case of working with EEG signals divided into 5 second time periods, the 1D-CNNs model has reached a better accuracy value. The accuracy values of each of the conventional machine learning methods decreased. This study shows the differences in accuracy values of various classification models for diagnosing schizophrenia via EEG signals. It also examines the effect ratio of the EEG epoch value, that is, certain time windows extracted from the EEG signal, on the classification models. The results of the study reveal that the success rate in classification of schizophrenia through EEG data is related to the epoch value.

1. Olejarczyk, Elzbieta, and Wojciech Jernajczyk. "Graph-based analysis of brain connectivity in schizophrenia." PloS one 12.11 (2017): e0188629.
2. Oh, Shu Lih, et al. "Deep convolutional neural network model for automated diagnosis of schizophrenia using EEG signals." Applied Sciences 9.14 (2019): 2870.
3. Hussain, Saqib, et al. "Evaluating Domain Knowledge and Time Series Features for Automated Detection of Schizophrenia from EEG Signals." human rights 3: 4.
4. Aydemir, Emrah, et al. "CGP17Pat: Automated Schizophrenia Detection Based on a Cyclic Group of Prime Order Patterns Using EEG Signals." Healthcare. Vol. 10. No. 4. MDPI, 2022.
5. Shoeibi, Afshin, et al. "Automatic Diagnosis of Schizophrenia in EEG Signals Using CNN-LSTM Models." Frontiers in Neuroinformatics 15 (2021).

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