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Recent Trends in Image Processing and Pattern Recognition

5th International Conference, RTIP2R 2022, Kingsville, TX, USA, December 1-2, 2022, Revised Selected Papers

Editors: KC Santosh, Ayush Goyal, Djamila Aouada, Aaisha Makkar, Yao-Yi Chiang, Satish K Singh

Part of the book series: Communications in Computer and Information Science (CCIS, volume 1704)

Conference series link(s): RTIP2R: International Conference on Recent Trends in Image Processing and Pattern Recognition

Conference proceedings info: RTIP2R 2022.

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About this book

This book constitutes the refereed proceedings of the 5th International Conference on Recent Trends in Image Processing and Pattern Recognition, RTIP2R 2022, held in Kingsville, TX, USA, in collaboration with the Applied AI Research Laboratory of the University of South Dakota, during December 01-02, 2022.

The 31 full papers included in this book were carefully reviewed and selected from 69 submissions. They were organized in topical sections as follows: healthcare: medical imaging and informatics; computer vision and pattern recognition; internet of things and security; and signal processing and machine learning.

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Keywords

artificial intelligence **classification methods** **computer security** **computer vision** **correlation analysis** **cryptography** **databases**

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Bibliographic Information

Book Title	Book Subtitle	Editors
Recent Trends in Image Processing and Pattern	5th International Conference, RTIP2R 2022, Kingsville, TX, USA,	KC Santosh, Ayush Goyal, Djamila Aouada, Aaisha Makkar,

Bibliographic Information

Book Title
Recent Trends in Image Processing and Pattern Recognition

Book Subtitle
5th International Conference, RTIP2R 2022, Kingsville, TX, USA, December 1-2, 2022, Revised Selected Papers

Editors
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Series Title
Communications in Computer and Information Science

DOI
https://doi.org/10.1007/978-3-031-23599-3

Publisher
Springer Cham

eBook Packages
Computer Science, Computer Science (R0)

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Softcover ISBN
978-3-031-23598-6
Published: 11 January 2023

eBook ISBN
978-3-031-23599-3
Published: 10 January 2023

Series ISSN
1865-0929

Series E-ISSN
1865-0937

Edition Number
1

Number of Pages
XIV, 420

Number of Illustrations
48 b/w illustrations, 144 illustrations in colour

Topics
Computer Imaging, Vision, Pattern Recognition and Graphics, Artificial Intelligence, Computer Engineering and

A Deep Learning-Powered Voice-Enabled Math Tutor for Kids

Arnab Banerjee, Srijoy Paul, Tisu Priya, Anamika Rohit & Nibaran Das

Conference paper | First Online: 11 January 2023

Part of the Communications in Computer and Information Science book series (CCIS,volume 1704)

Abstract

In this study, a voice enabled math tutor system is proposed that enables children to practice math problems on their own. For this, we have developed numerical sound dataset targeting the application. In the application, when the system is turned on, a math problem is generated, and the child will respond verbally to it. The system will categorize the audio data (user-provided answer) and produce a text number, which will then be further analysed and generate output as either a correct or erroneous answer. Any toy can be equipped with the proposed system, allowing a kid to practice problems while engaging with the system. A dataset named JUDVLP-BCRP: numeralSound.v1 is prepared, with 2315 audio data of numerals in the range of 0 to 9. In a typical setting, the audio data were collected from people in the age range of 10 to 60 from West Bengal, Jharkhand, Delhi, Assam, Bihar, and Orissa. After pre-processing the audios, Mel spectrograms were produced which acts as input by the deep neural network algorithms. The audio data has been classified using a number of well-known deep learning algorithms, including DenseNet-121, VGG-16, modified DenseNet121 (DenseNet-41), and modified VGG-16 (VGG-12). Using DenseNet-121, VGG-16, DenseNet-41, VGG-12, 94.60%, 98.70%, 98.27%, and 98.48% accuracy was obtained. The networks were run for 100 epochs using a learning rate of 0.0001, and categorical cross-entropy loss function. The VGG-16 produced the highest precision of 98.9%, and the VGG-12 produced the second-best precision of 98.6%. The outcomes are positive and influence a workable system design.

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Keywords

Sound classification | Deep learning | Math tutor | Numeral sound classification | Voice enabled

Supported by Dr. B. C. Roy Polytechnic and Jadavpur University.

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About this paper

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Banerjee, A., Paul, S., Priya, T., Rohit, A., Das, N. (2023). A Deep Learning-Powered Voice-Enabled Math Tutor for Kids. In: Santosh, K., Goyal, A., Aouada, D., Makkar, A., Chiang, YY., Singh, S.K. (eds) Recent Trends in Image Processing and Pattern Recognition. RTIP2R 2022. Communications in Computer and Information Science, vol 1704. Springer, Cham. https://doi.org/10.1007/978-3-031-23599-3_31

Download citation

.RIS .ENW .BIB

DOI	Published	Publisher Name
https://doi.org/10.1007/978-3-031-23599-3_31	11 January 2023	Springer, Cham

Print ISBN	Online ISBN	eBook Packages
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