Hochschule RheinMain
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Fachbereich
Design Informatik Medien
Informatik-Studiengänge

To Whom It May Concern:

Sept. 14, 2017

We hereby confirm that **Mr Shah Rukh Qasim** (born Oct 10 1996) has been working as a research intern over Summer 2017 (Jun-Sep) with the University of Applied Sciences RheinMain (HSRM) in Wiesbaden / Germany.

HSRM is running an exchange program with Dr. Faisal Shafait's group at the National University of Sciences and Technology (NUST) in Islamabad / Pakistan. From June to September 2017, Shah Rukh joined us in Wiesbaden as one of four interns from Islamabad. Under supervision by Prof. Dr. Ulrich Schwanecke and Prof. Dr. Adrian Ulges, he worked in Ulrich's lab „Computer Vision and Mixed Reality" (CVMR) (http://cvmr.info/) on our joint project FIBEVID (http://fibevid.info/). FIBEVID is funded by the German Academic Exchange Service (DAAD), and targets underwater computer vision.

Shah Rukh's contributions during the internship were focused on innovative approaches towards counting fish in very crowded underwater scenes, and included:

- An literature review of recent work on visual counting. Prior work here is mostly based on convolutional neural networks (CNNs) and targeted at counting crowds of people
- The reimplementation and refinement of several of the above CNN-based techniques (like VGG-16), e.g. by experimenting with different CNN architectures
- A novel approach integrating of optical flow information into the CNN-based framework
- The acquisition of suitable datasets, including video-based crowd and fish swarm imagery with suitable ground truth (as counting has only been tackled recently, neither were available publicly).

Prof. Dr. Adrian Ulges

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- The synthesis of artificial data for virtualization of training sets
- An evaluation of the aforementioned techniques on the above video datasets. Specific tasks included dataset generation, the manual acquisition of extensive ground truth, the training of the above neural models, the quantiative benchmarking on scientific computing hardware using the Tensorflow framework, and the presentation and discussion of results at weekly meetings.
- The integration of the most successful approaches into a demo system.

During his stay, Shah Rukh was able to make strong contributions, and we very happy with his overall performance. In case of any questions regarding Shah Rukh's work experience with HSRM, feel free to contact us. We wish Shah Rukh all the best for his future endeavours!

Yours sincerely

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