

Qualification Project, June, 2019

Chair in Business Administration, especially Information and Service Systems at Saarland University deals with the **development and management of data-driven services**, for instance healthcare and agriculture. Dialog system research, amongst others with Pepper robot as an interface.

Directed by Prof. Dr.-Ing. [Wolfgang Maaß](http://iss.uni-saarland.de/en/team/detail/wolfgang/maass/), the chair investigates how the

application of experimental design methods combined with distributed, data analytic approaches lead to adaptive service designs and innovative solutions.

This research is conducted in **basic and applied research projects in** cooperation with leading research and industry partners. Results are applied and validated in industry projects by the [research group Smart Service Engineering (S2E) at the German Research Center for Artificial Intelligence (DFKI)](http://www.dfki.de/web/research/sse).

Main topic

* Service Design und Management
* Data-driven Services (z.B. Health, Smart Farming, TUCANA, EVAREST etc.)
* Conceptual Modeling

There are 5 research assistants, 15 student assistants

The research group Smart Service Engineering (S2E) at DFKI investigates solutions for systematically designing and developing smart service systems at the interface between technical and economic issues. The research conducted by S2E includes:

* Systematic methods, technologies and platforms for acquisition, storage and analysis of unstructured and sensor-based data for deriving smart services
* Development of applications in industrial manufacturing, healthcare, wellness and sport as well as agriculture amongst others
* Economic analysis and projection of changes in companies caused by smart services, esp. in innovation management and product design
* ·Innovative business modeling by means of smart services

Main research aspects are conceptual modeling and systematic development of smart services, application of semantic web technologies and the evolvement of technical smart service platforms.

Since we are getting a lot of applications and tend to give longer hiwi contracts, we have to know the applicants better regarding their skill set, practical experience and also passion for their work before starting the contract

* Qualification project (4 weeks with 10 hours a week)
* Objective: Hiwi position (8 - 16h) for 3 months at Chair in Information and Service Systems (UdS) or research group “Smart Service Engineering” at DFKI
* Presentation of results of qualification project after 4 weeks -> decision for or against contract for hiwi position
* In case of positive decision invested working hours (40) will be rewarded in contract

Topic of qualification project: Computer vision

***Task: create predictive model that given an image of one of ten object categories estimates what category the image belongs to. Try to get the best accuracy possible. Create a web interface to showcase your results. Visualisation and final results (metrics) carry equal weight.***

***Final grades will be based on how good the implementation is, complexity of the models used, hold on the programming language and final visualisation of the results.***

***Dataset:*** [***https://www.cs.toronto.edu/~kriz/cifar.html***](https://www.cs.toronto.edu/~kriz/cifar.html) ***, CIFAR10***

*The CIFAR-10 and CIFAR-100 are labeled subsets of the* [*80 million tiny images*](http://people.csail.mit.edu/torralba/tinyimages/) *dataset. They were collected by Alex Krizhevsky, Vinod Nair, and Geoffrey Hinton.*

***The CIFAR-10 dataset***

*The CIFAR-10 dataset consists of 60000 32x32 colour images in 10 classes, with 6000 images per class. There are 50000 training images and 10000 test images.*

*The dataset is divided into five training batches and one test batch, each with 10000 images. The test batch contains exactly 1000 randomly-selected images from each class. The training batches contain the remaining images in random order, but some training batches may contain more images from one class than another. Between them, the training batches contain exactly 5000 images from each class.*

*Here are the classes in the dataset, as well as 10 random images from each:*

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***airplane*** |  |  |  |  |  |  |  |  |  |  |
| ***automobile*** |  |  |  |  |  |  |  |  |  |  |
| ***bird*** |  |  |  |  |  |  |  |  |  |  |
| ***cat*** |  |  |  |  |  |  |  |  |  |  |
| ***deer*** |  |  |  |  |  |  |  |  |  |  |
| ***dog*** |  |  |  |  |  |  |  |  |  |  |
| ***frog*** |  |  |  |  |  |  |  |  |  |  |
| ***horse*** |  |  |  |  |  |  |  |  |  |  |
| ***ship*** |  |  |  |  |  |  |  |  |  |  |
| ***truck*** |  |  |  |  |  |  |  |  |  |  |

*The classes are completely mutually exclusive. There is no overlap between automobiles and trucks. "Automobile" includes sedans, SUVs, things of that sort. "Truck" includes only big trucks. Neither includes pickup trucks.*

***Download***

*If you're going to use this dataset, please cite the tech report at the bottom of this page.*

|  |  |  |
| --- | --- | --- |
| ***Version*** | ***Size*** | ***md5sum*** |
| [*CIFAR-10 python version*](https://www.cs.toronto.edu/~kriz/cifar-10-python.tar.gz) | *163 MB* | *c58f30108f718f92721af3b95e74349a* |
|  |  |  |
|  |  |  |

***Baseline results***

*You can find some baseline replicable results on this dataset* [*on the project page for cuda-convnet*](http://code.google.com/p/cuda-convnet/)*. These results were obtained with a convolutional neural network. Briefly, they are 18% test error without data augmentation and 11% with. Additionally,* [*Jasper Snoek*](http://www.cs.toronto.edu/~jasper/) *has a* [*new paper*](http://hips.seas.harvard.edu/content/practical-bayesian-optimization-machine-learning-algorithms) *in which he used Bayesian hyperparameter optimization to find nice settings of the weight decay and other hyperparameters, which allowed him to obtain a test error rate of 15% (without data augmentation) using the architecture of the net that got 18%.*

***Other results***

[*Rodrigo Benenson*](http://rodrigob.github.com/) *has been kind enough to collect results on CIFAR-10/100 and other datasets on his website;* [*click here*](http://rodrigob.github.com/are_we_there_yet/build/classification_datasets_results.html) *to view.*

***Dataset layout***

***Python***

*I will describe the layout of the Python version of the dataset.*

*The archive contains the files data\_batch\_1, data\_batch\_2, ..., data\_batch\_5, as well as test\_batch. Each of these files is a Python "pickled" object produced with* [*cPickle*](http://www.python.org/doc/2.5/lib/module-cPickle.html)*. Here is a python2 routine which will open such a file and return a dictionary:*

*def unpickle(file):*

*import cPickle*

*with open(file, 'rb') as fo:*

*dict = cPickle.load(fo)*

*return dict*

*And a python3 version:*

*def unpickle(file):*

*import pickle*

*with open(file, 'rb') as fo:*

*dict = pickle.load(fo, encoding='bytes')*

*return dict*

*Loaded in this way, each of the batch files contains a dictionary with the following elements:*

* ***data*** *-- a 10000x3072* [*numpy*](http://numpy.scipy.org/) *array of uint8s. Each row of the array stores a 32x32 colour image. The first 1024 entries contain the red channel values, the next 1024 the green, and the final 1024 the blue. The image is stored in row-major order, so that the first 32 entries of the array are the red channel values of the first row of the image.*
* ***labels*** *-- a list of 10000 numbers in the range 0-9. The number at index i indicates the label of the ith image in the array data.*

*The dataset contains another file, called batches.meta. It too contains a Python dictionary object. It has the following entries:*

* ***label\_names*** *-- a 10-element list which gives meaningful names to the numeric labels in the labels array described above. For example, label\_names[0] == "airplane", label\_names[1] == "automobile", etc.*

***Reference***

*This tech report (Chapter 3) describes the dataset and the methodology followed when collecting it in much greater detail. Please cite it if you intend to use this dataset.*

* [*Learning Multiple Layers of Features from Tiny Images*](https://www.cs.toronto.edu/~kriz/learning-features-2009-TR.pdf)*, Alex Krizhevsky, 2009.*

Organization of qualification project

* Intermediate result meeting at 18th of June, 11:00 am in seminar room 2.24, building A5 4 with the possibility to ask questions about the tasks
* Presentation of final result of qualification project at 2nd of July, 11:00 am in seminar room 2.24, building A5 4. Each presentation should take about 10 to 15 minutes
* If you miss a meeting without an excuse in advance, we assume you are not interested in the position any more
* Contact person: Svenja Kern (svenja.kern@uni-saarland.de)