

Bijan Chokoufe Nejad

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welcome

I just finished my physics studies at the University of Wuerzburg and feel the [inexplicable](#) urge to share some information with you honorable visitor. Mainly it is work that I've done and which might be useful to others or stuff which I'm frequently asked for.

You can browse through this site or read it as plain text in one [pdf file](#). Note, that if you also want all associated files, you should get the [tar ball](#). Furthermore, you can download any individual file as [pdf](#) via the link in the footer.

This site has been created with [Markdown](#) or more specifically with [Pandoc](#).
Last update: 2014-04-25

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talks

All presentations have been created with the [Beamer](#) LaTeX class.

Checkpointing in CUBA

Status report of the six-week *FOKUS research internship* at the [Max Planck Institute Munich](#) with Dr. Thomas Hahn. Main topic is the implementation of check-pointing, i.e. saving of current progress, for the [CUBA](#) library which offers different methods for multidimensional numerical integration. (2013, English)

Geometric Origin of Scaling in Large Traffic Networks

A discussion of the [paper](#) by Popović et al. which shows that the observed scaling exponents have a geometric origin. A simple model is studied both analytically and in simulations with agreeing results for the exponents. Originally prepared for the *FOKUS research module: Complex Systems* of Prof. H. Hinrichsen, Prof. W. Kinzel and Dr. J. Reichardt. (2013, English)

Symmetry of the Superconducting Gap

The first part is a quick reminder of the theory of superconductivity as mean-field solution. In the second part, the gap function is decomposed in basis functions with the symmetry of the lattice. Originally prepared for the *Oberseminar: Symmetries in solid state physics* with Prof. G. Sangiovanni. (2012, German)

Introduction to Quantum Computing

A rather basic introduction to quantum computing, originally prepared for the lecture *Information Theory and Quantum Computing* of Prof. H. Hinrichsen and Dr. J. Reichardt. (2012, English)

Ferromagnetism

A talk about spin waves, also known as magnons, in the Heisenberg model, originally prepared for the lecture *Quantum Mechanics III: Many-Body Physics* of Prof. W. Hanke. (2012, German)

Nonlinear Oscillations

This presentation about nonlinear behaviour, especially in the Duffing oscillator, contains a video of a rather neat simulation where you can see chaotic behaviour. It has been created with [Mathematica](#). The talk also comes with [proceedings](#) for the interested reader. Originally prepared for the *Hauptseminar* of PD W. Winter. (2011, German)

write-ups

Numerical Calculations of Multi-Jet Cross Sections

My *Master thesis* at TP II: Theoretical Elementary Particle Physics (University of Wuerzburg), supervised by Prof. Dr. T. Ohl, includes a new computational method to compute amplitudes with a virtual machine. Furthermore, methods for the efficient computation of multi-jet cross sections are reviewed, especially helicity Monte Carlo and QCD antenna phase space sampling. The corresponding [talk](#) is pending. (2014, English)

Decays of the Higgs boson

A *Miniresearch Project* about the various decays of the Higgs boson in the Standard model. Covered are all tree level processes as well as the one-loop calculation of the decay to two gluons. Finally, the branching ratios are shown and compared to the [literature](#). (2012, English)

Landau levels in bilayer quantum spin Hall systems

My *Bachelor thesis* at TP IV: Mesoscopic Physics (University of Wuerzburg), supervised by Prof. Dr. B. Trauzettel and Dr. P. Michetti, provides a theoretical calculation of the expected experimental results when a strong magnetic field is applied to a [double quantum well](#) with interlayer voltage. It is shown that the existence of a crossing of $n = 0$ Landau levels leads to the same necessary condition for the interlayer voltage as the existing calculation of the topological invariant. For this work, there is also a [talk](#) available. (2012, English)

% Bijan Chokoufe Nejad - Other % Bijan Chokoufe Nejad % 2014-04-25

latex

I have written some convenience packages which allow to straightforwardly use LaTeX with all its power. `bcn_commands` adds some functionality and shorthand notations which you can adopt or use as inspiration. For example, using `\Al()`, `\Bl()`, `\Cl()` and `\Dl()` seems way more intuitive than remembering the ordering of `\bigl()`, `\Bigl()`, `\biggl()` and `\Biggl()`. Installation instructions are in the header of the documents.

bcn koma

A wrapper package for my commonly used packages in KOMA-Script files. The environment `Balign` is defined here and not in `bcn_commands` since the definition is different for Beamer presentations where numbering of equations is not really reasonable.

bcn beamer

Basically the same as `bcn_koma` adapted to the already loaded packages of Beamer. It allows to set the two colors of a talk via `\fstcol` and `\sndcol` and needs `bcn_color`. Furthermore, some Beamer specific commands are defined.

bcn color

Some color mixtures and codes which are viewable not only on screen but more importantly also tested on beamers.

bcn commands

The biggest `bcn` package adds some math operators that are astonishingly not part of `amsmath`. A math operator starting with a capital letter takes one argument and sets automatically appropriate braces. Shorthands for partial and total derivatives are given as well as proper spacing of the integration measure (`\Int`). Vector arrows are redefined to `boldsymbols`. `bcn_commands` provides a full quantum mechanics package with intuitive notation for `bra`, `ket`, `braket` and so on. Some simplifications for drawings are included as well as fermion propagators for the friends of high energy physics. Speaking of which, an automatic `Feynmp` call allows to produce Feynman graphs without further user intervention than calling `pdflatex`. Finally, there are a lot of short hand notations which help to minimize typing.

bcn letter

A ready-to-use `template` for writing german letters using `KOMA scrlltr2` with a small workaround for the footer. Hereby, you can decide how much information you want to show the recipient and the layout adjusts to two or three column style. With the needed packages, it should look like [this](#) if you compile the [example](#).

bcn beamer template

To get started with Beamer, you might find it handy to have a `template` instead of writing everything from scratch. Some features are used but certainly not all.

coding

As a fellow nerd you might be interested in my [github](#) repository.

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contact information

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