Absender:
Ludwig Schubert Romanstraße 19 80639 München

Technische Universität München
Immatrikulation des SSZ

Arcisstraße 21
80333 München

Technische Universität München Immatrikulation des SSZ Arcisstr. 21 80333 München	Eingang

Technische Universität München

Antrag auf Zulassung bzw. auf Immatrikulation im Studiengang / Application for a place on course of study or for enrollment in a course of study
Informatik / Informatics
Masterstudium [Master of Science]
Wintersemester 2013/14

Personendaten / Personal data

Anrede / Form of address	Herr
Akad. Grad vor dem Namen / Academic degree before the name	
Familien- oder Nachname / Last name	Schubert
Vorname(n) / First name(s)	Ludwig
Namenszusatz / Name affix	
Geburtsdatum / Date of birth	18.06.1989
Geburtsort / Place of birth	Berlin-Mitte
Geburtsname / Maiden name	
Staatsangehörigkeit / Nationality	Deutschland
Vollständiger Name / Full name	Ludwig Friedemann Schubert
E-Mail-Adresse / E-mail address	ludwigschubert@mytum.de

Studiengangsauswahl / Select degree program

Art des Studiums / Type of studies	Masterstudium
Abschlussziel / Intended degree	Master of Science
Studium / Degree Course	Informatik
konsekutiv zu / konsekutiv zu	Informatik [Bachelor of Science]
Zulassungsart / Type of admission	Eignungsverfahren
Form des Studiums / Form of studies	Konsekutives Masterstudium
Einstiegssemester / Entrance semester	1

Hochschulzugangsberechtigung / Higher education entrance qualification

Hochschulreife / University entrance qualification	Allgemeine Hochschulreife
Schulart/Prüfungsart / School type/exam type	Gymnasium
Originalbezeichnung des Zeugnisses / Original name of certificate	Zeugnis der allgemeinen Hochschulreife
Zeugnisdatum / Date of certificate	27.06.2008
Durchschnittsnote / Overall average grade	1,2
Name der Schule / Name of school	Gisela-Gymnasium
Ort der Schule / Place of school	München
Land/Stadt / Country/City	Deutschland

Für händische Notizen des Sachbearbeiters: [ST]

Antragsnummer: 1-00176249

Matrikelnummer: 03604650

Korrespondenzadresse / Postal address

Straße/Hausnummer / Street and number	Romanstraße 19
PLZ/Ort / Postal Code/City	80639 München
Land / Country	Deutschland
Zustellhinweis / Delivery notes	
Festnetz / House phone	+49-89-17117510

Heimatadresse / Home address

Straße/Hausnummer / Street and number	Romanstraße 19
PLZ/Ort / Postal Code/City	80639 München
Land / Country	Deutschland
Zustellhinweis / Delivery notes	

Krankenversicherung / Health Insurance

Ich bin in Deutschland gesetzlich versichert: Techniker Krankenkasse, -Rechtskreis West und Ost- - 15027365; 1806890879

Sprachkenntnisse / Language skills

Englisch	Nachweis über eine gute Note in Englisch (entsprechend mindestens 10 von 15 Punkten) in einer inländischen Hochschulzugangsberechtigung (Abitur, Fachabitur)

Akademische Vorbildung / Academic background

Land / Country	Deutschland
Hochschule / University	TU München
Abschlussziel / Intended degree	Bachelor of Science
Form des Studiums / Form of studies	Erststudium
Matrikelnummer / Registration number	03604650
1. Studienfach / Major (1st subject)	Informatik
2. Studienfach / 2nd subject	
3. Studienfach / 3rd Subject	
Semester von / Term from	Wintersemester 2009/10
Semester bis / Term to	Sommersemester 2013
Semester gesamt / total semesters	8

davon / from which	Urlaub / Holiday	Praxis / Practical training	Klinik / Hospital	Unterbrechung / Break
	1	0	0	0

Zwischenprüfung / Intermediate exam	noch nicht abgelegt
Abschlussprüfung / Final examination	noch nicht abgeschlossen

Weitere Angaben / Further Information

Ich habe an außerschulischen Aktivitäten teilgenommen (z.B. "Jugend Forscht", Naturwissenschaftliche Olympiade, Praktika, ehrenamtliche Tätigkeit, soziales Engagement, etc.).
Ich studiere nebenbei im Elitestudiengang "Technologiemanagement" des CDTMs. Meine Durchschnittsnote beträgt 1,1.

Ich bin Mitglied bei best.in.TUM und war Schueler.In.TUM Student.

Essay / Essay

% Better viewed at http://bit.ly/tum-master

% From ubiquitous sensors to insights

% Ludwig Schubert

% March 24, 2013

Application to TUM's Master Program in Computer Science, Essay subject 2: *What is the impact of ubiquitous sensors and how does Informatics help to analyze the collected data?*

This essay is written in Markdown. The body-only word count is 1002. References are given in [square brackets] and are listed at the end of the document.

From ubiquitous sensors to insights

Towards the "Internet of Things"

Cheaper sensor prices, large-scale adoption of portable computing devices and a growing degree of interconnection between electronic devices cause a massive increase of produced data.[McKinsey] Today's vision of how this trend will culminate, the "Internet of Things", would mean a global network with vastly more participants than humans on earth.

My scale uploading my weight to an online portal where my smartphone can use it during my runs[Withings] to calculate burned calories gives merely a humble preview of the interconnectedness we're facing.

This unprecedented growth in required storage and processing capabilities poses a set of challenges for Informatics to overcome. Pure volume is the first unsolved problem.

In fact, data volume is growing faster than storage volume; and since 2009 has surpassed available storage volume. [IDC, pp. 9¿10] It's hard to overstate the paradigm shift this induces: we are literally running out of memory and processing power to cope with the onslaught of data.

Additionally, organization, meaningful statistics, visualization, long-term storage, secure access and lack of structure & comparability are equally problematic.

Informatics - Enabler & Innovator

Informatics acts both as an enabler¿by providing efficient algorithms and new data structures to deal with this increased amount of data¿and as an innovator¿by finding new use cases and computing meaningful results which extract value from those large amounts of data.

Informatics as an Enabler

Informatics can help programmers in dealing with those large amounts of data.

Currently the only practical way of handling this data is parallel computing. Since parallel programming is inherently hard[McKenney], Informatics can assist developers by creating new programming languages, frameworks or models which abstract the parallelization layer away from them. Popular examples are the MapReduce programming model [MapReduce], Bigtable as an alternative to traditional relational database systems [Bigtable], and the key-value store Dynamo [Dynamo].

But one can even observe new programming languages being created with built-in support for concurrency, enabling easy parallelization of code, like Google's Go. Since those new languages often build on older, pre-established concepts (in the case of go's concurrency support: Hoare's Communicating Sequential Processes) older languages that suit the concurrent programming styles are resurgent, such as Erlang. It originated in the late eighties, but today by web companies like Facebook and Wooga use it to support their massive user bases. Erlang offers language-level support for concurrency similar to the aforementioned Go.

However, even the biggest data processing capability is by itself a means, not an end. To extract meaningful information even from condensed data it is often needed to visualize the results in a way that is approachable to humans. The last years saw an increase in the usage of data rich "info-graphics" in journalistic publications that is unlikely to wear off soon. The general increase in data driven decision-making in the industry will need even more visualization techniques and talent. This in turn will likely lead to a closer collaboration between designers and coders, or even new kinds of jobs with overlapping responsibilities. Rune Madsen, for example, already holds a graduate course called "printing code" for which he argues "during the last decade [the line between graphic design and programming] has obviously blurred, but not to the degree one would expect"[¿]. I'm expecting this development to continue, especially outside the field of scientific visualization and towards more general data visualization for businesses.

Informatics as an Innovator

While a historic example, Google's Page Rank algorithm can in hindsight serve as an excellent example of a data-driven innovation. [Rajaraman] argues that the simple use of *more data*¿as in "including anchor text of links linking to", in addition to "the content of" a website¿was the pivotal improvement in search engine utility.

Future startups and scientific applications can possibly make similar advancements by including data that hadn't been included previously into their datasets, or by not having to restrict big datasets at all. [Halevy] retells how an in-painting algorithm that performed poorly with a few thousand images in its training data set suddenly became very useful when researchers expanded said dataset by several orders of magnitude.

In general it is much harder to predict Informatics' role as an innovator than as an enabler ¿ after all, enough real world challenges already exists in which a better information distribution can improve performance. It is inherent to innovations to not be predictable beforehand. However, one can extrapolate from current trends which areas computer scientist are currently studying intensively.

Three subfields that readily come to (my) mind are Natural Language Processing, Artificial Intelligence and Cluster Computing. Both NLP and AI will profit greatly from the possible increase in data size and less selective data samples. Cluster Computing on the other hand is already rapidly advancing, as de-facto standards have emerged in the industry (e.g. Hadoop) that have already been surpassed hundredfold in speed by newer research projects. (e.g. UCB's Spark)

Summing up, Informatics is at an exiting point in time now ¿ for the first time, data management problems have grown so big that we literally can't fix them by increasing resources. We will have to find more advanced processes.

Conclusion

Like any new technological development in the past, Big Data starts out as an inherently value-neutral concept. Nuclear power comes to mind, mechanical printing, BitTorrent or even the Internet itself. But in the same way that BitTorrent leaves the decision to download widely available illegal content to its users, Big Data puts computer scientists in a position of social responsibility that most of us don't seem to realize. Constant surveillance by myriads of sensors and data collectors can just as easily restrict human freedom as it can enable it. But unlike programming models or tools for enabling large-scale data processing, I'm not aware of any kind of reusable concepts which informatics could offer to avoid such harmful usage. The moral judgement remains¿as it has always been¿in the hands of the individual developer.

References

References which have not been used in the text to back up statements have been used for general research and are still listed here.

[IDC] IDC, ¿A Digital Universe Decade ¿ Are You Ready?,¿ vol. 2009, no. Figure 1, 2010.

[Bigtable] F. Chang, J. Dean, and S. Ghemawat, ¿Bigtable: A distributed storage system for structured data,¿ ACM Transactions on ¿, 2008.

[McKenney] P. McKenney, M. Gupta, and M. Michael, ¿Is parallel programming hard, and if so, why?,¿ 2009.

[Rajaraman] A. Rajaraman, ¿More data usually beats better algorithms,¿ 2008. [Online]. Available: http://anand.typepad.com/datawocky/2008/03/more-data-usual.html. [Accessed: 18-Mar-2013].

[Boyd] D. Boyd and K. Crawford, ¿Six provocations for big data,¿ pp. 1¿17, 2011.

[McKinsey] J. Manyika, M. Chui, B. Brown, and J. Bughin, ¿Big data: The next frontier for innovation, competition, and productivity,¿ McKinsey Global Institute, no. June, 2011.

[Withings] ¿Withings Smart Body Analyzer + Runkeeper + Weightbot.¿ [Online]. Available: http://www.withings.com/en/bodyanalyzer. [Accessed: 31-Mar-2013].

[Dynamo] G. Decandia, D. Hastorun, M. Jampani, G. Kakulapati, A. Lakshman, A. Pilchin, S. Sivasubramanian, P. Vosshall, and W. Vogels, ¿Dynamo: amazon¿s highly available key-value store,¿ ACM SIGOPS ¿, pp. 205¿220,

Essay / Essay

2007.

[MapReduce] J. Dean and S. Ghemawat, ¿MapReduce: simplified data processing on large clusters,¿ Communications of the ACM, pp. 1¿13, 2008.

[Ghemawat] S. Ghemawat, H. Gobioff, and S. Leung, ¿The Google file system,¿ ACM SIGOPS Operating Systems ¿, vol. 37, no. 5, p. 29, Dec. 2003.

[Ma] Y. Ma, M. Richards, M. Ghanem, Y. Guo, and J. Hassard, ¿Air Pollution Monitoring and Mining Based on Sensor Grid in London,¿ Sensors, vol. 8, no. 6, pp. 3601¿3623, Jun. 2008.

[Halevy] A. Halevy, P. Norvig, and F. Pereira, ¿The Unreasonable Effectiveness of Data,¿ IEEE Intelligent Systems, vol. 24, no. 2, pp. 8¿12, Mar. 2009.

[Madsen] ¿Rune Madsen ¿ Printing Code course description¿ [Online]. Available: http://runemadsen.com/printing-code. [Accessed: 01-Apr-2013].

[Li] I. Li, ¿Personal informatics & context: Using context to reveal factors that affect behavior,¿ Journal of Ambient Intelligence and Smart ¿, no. August, 2012.

Lebenslauf / Résumé (CV)

Curriculum Vitae Ludwig Schubert

Personal data

date of birth: 06/18/1989

place of birth: Berlin-Mitte

Certificates

* German Abitur, GPA: 1.2

  AP courses: mathematics & physics

* SAT Math Level 2: 770 of 800

  SAT Physics: 800 of 800

Languages

Lebenslauf / Résumé (CV)

German: native language

English: fluent, TOEFL internet based test: 119 of 120

French: basic knowledge, DELF-Diploma Level A2

Higher Education

October 2007¿August 2009: *Technical University Munich*

* early study of computer science ¿Schueler.In.TUM¿ during school

* GPA during program duration: 1.15

October 2009¿now: *Technical University Munich*

* bachelor computer science, currently 6th semester

* current GPA 2.3

August 2011¿now: *Center for Digital Technology & Management*

* elite graduate program technology management, currently 3nd semester

* current GPA 1.1

November 2012¿April 2013: *Stanford University*

* visiting researcher at the HCI Group at Stanford¿s Computer Science department

Teaching Experience

April 2011: Tutor in an undergraduate seminar on iOS Programming at TUM

November 2011¿December 2011: Lecturer "iOS Application development" at CDTM

August 2012: Lecturer ¿iOS Application development¿ at Commerbank AG

Publications

CDTM Trend Report Fall 2011: Ambient Assisted Living, ISBN: 978-3-9812203-9-1

ONWARD 2011: weMakeWords, R.Demmel, B.Köhler, S.Krusche, L.Schubert, (Proceedings of the 10th SIGPLAN Symposium [¿], Portland, OR, Oct 22-27, 2011) 109-110, 2011.

Professional IT Experience

May 2006: Klinikum III. Orden: I assisted the IT helpdesk and built workstations

Lebenslauf / Résumé (CV)

2008¿now: independent iOS developer

* DTMF Dialer, helps dialing on landlines, http://it.ludwigschubert.de/dtmfdialer

* Coin Toss, a CoreAnimation Demo, http://it.ludwigschubert.de/dtmfdialer

* ragr, a ragefaces image pasteboard, http://it.ludwigschubert.de/ragr

2010¿2011: Sorin Cardiopulmonary: development of a custom database client, app development consulting

2010¿now: Weptun GmbH: iOS developer focussing on application UI.

* work included: Kempinski, RWE, clixxie (German iPad Top Ten Free Apps)

* http://www.weptun.de/apps-entwicklung-2-0/app-projekte/

Hobbies

Hiking, in particular multi day hikes

* longest hike so far was a transalp, munich to venice

Photography, focussing on portraiture

* portfolio at http://foto.ludwigschubert.de.

Music, both classical & modern

* classical guitar, electric & acoustic bass guitar

* member of the band ¿Iron Rose¿ at http://www.ironrose.de.

Motivationsschreiben / Letter of Motivation

Schon während meines Frühstudiums der Informatik traf ich für mich zwei Entscheidungen:

Informatik zu studieren und Informatik an der TUM zu studieren.

Von einem Informatikstudium erwarte ich mir einen spannenden, zukunftsorientierten Studiengang ¿ meine Erfahrungen im Bachelorstudiengang überzeugten mich davon, dass ich mit Informatik mein größtes Hobby zu meinem Beruf machen kann. Die gute Zusammenarbeit mit Professoren der TU hat mich immer sehr erfreut. So konnte ich in verschiedenen Ferienakademien und Sommerschulen z.B. in St. Petersburg feststellen, dass ich auch persönlich von den Erfahrungen meiner Professoren profitieren kann. Ich habe es sicher Prof. Bruegge zu verdanken bereits im Bachelor an seinem Lehrstuhl an einem peer-reviewed paper mitschreiben zu können.

Das der Beruf gute Zukunftsaussichten mit sich bringt und sehr ordentliche Verdienstmöglichkeiten bietet war zwar für die Entscheidung nicht ausschlaggebend, aber doch sehr beruhigend zu wissen und bestärkte mich so in meinem Entschluss.

Die Frage nach der Universität war für mich recht schnell geklärt: die lockere, freundliche Atmosphäre mit der wir Schüler bei Ihnen sowohl von Tutoren und Professoren, wie auch von Mitstudenten empfangen worden sind, hat mir sehr zugesagt. Das Ansehen der Universität und Beurteilungen bei Hochschulrankings tun ihr übriges. Für mich von persönlichem Interesse ist auch das Selbstverständnis der TUM als "unternehmerische Universität". Ich studiere nebenbei im Elitestudiengang Technologie-Management am CDTM, was ich für eine wunderbare Einrichtung der TU (und LMU) halte.

In meinem Auslandssemester in Kalifornien und auch in Deutschland mit Freunden konnte ich andere Universitäten kennen lernen, aber für mich ist die TUM immer noch eine gute Wahl, die ich nicht bereue.

Motivationsschreiben / Letter of Motivation

Ich hoffe ab dem Wintersemester mein Studium an der TUM weiterführen zu können!

Elektronische Dokumente / Electronic documents

Bescheinigung über eine studentische Krankenversicherung (ausgestellt von einer gesetzlichen Krankenkasse)	Versicherungsbescheinigung.pdf (90,0 KB)
Personalausweis	Ludwig Schubert - Reisepass.pdf (487,6 KB)

Ich beantrage die Zulassung bzw. die Immatrikulation im oben angeführten Studiengang an der Technischen Universität München nach Maßgabe meiner vorstehenden Angaben. Ich versichere, dass ich die Angaben in diesem Antrag vollständig und wahrheitsgemäß gemacht habe. Die geforderten Nachweise sind beigefügt.

Sofern ich mich um einen Studienplatz mit Eignungsfeststellung bewerbe, versichere ich, dass ich die schriftliche Begründung zur Wahl des Studienganges (Motivationsschreiben) selbständig und ohne Hilfe anderer angefertigt habe. Entsprechendes gilt für das Essay, sofern es im Rahmen des Verfahrens gefordert ist. Der tabellarische Lebenslauf stellt meinen lückenlosen Werdegang bis zum Zeitpunkt der Studienbewerbung dar.

Mir ist bekannt, dass fahrlässig oder vorsätzlich falsche Angaben ordnungswidrig sind und jederzeit zum Widerruf der Zulassung und Immatrikulation führen.

Ich erkläre weiterhin, dass ich mich als Student der Technischen Universität München selbst über die für meinen Studiengang gültige Prüfungsordnung bzw. -fristen, sowie jeweils auch über Rückmeldebekanntmachungen informieren werde.

Anschriftenänderungen werde ich der Technischen Universität München unverzüglich mitteilen bzw. unter www.campus.tum.de sofort ändern.

Darüber hinaus habe ich zur Kenntnis genommen, dass meine Daten im Rahmen der gesetzlichen Bestimmungen für ein Jahr aufbewahrt werden müssen.

I request admission/enrollment in the above course at Technische Universität München based on the information provided. I confirm that all the information in this application is complete and truthful. The required documentary evidence is enclosed.

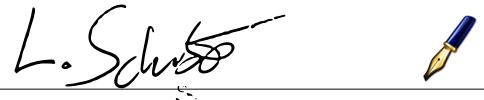
Insofar as I am applying for a place with aptitude test, I affirm that my written rationale for my choice of course (personal statement) was written independently and without assistance. The same applies to the essay, if required by the application procedure. My tabular CV shows full details of my education and development up to the time of application.

I am aware that false information provided negligently or deliberately is contrary to regulations and can result in the withdrawal of admission and enrollment at any time.

I also hereby confirm that as a student at Technische Universität München I will find out about examination regulations and deadlines for my course as well response announcements myself.

I will inform Technische Universität München immediately of any change of address without delay or make the necessary changes at www.campus.tum.de.

I acknowledge that my details have to be stored for one year in line with legal requirements.

Menlo Park, 5. Mai 2013 

Ort, Datum / Place, Date	Unterschrift des Bewerbers / Sign of Applier	bei Minderjährigen Unterschrift des Erziehungsberechtigten / If under aged, signature from parent/guardian

Die hier aufgeführten Dokumente müssen Sie Ihrem ausgedruckten und unterschriebenen Antrag beifügen und postalisch einsenden. / Documents stated herein must be included in your printed and signed application form and sent postal (mandatory).

- Fächer und Notentranskript von bisherigen Studien (Kopie - beglaubigt) / Subject and grade transcript of studies to date (Kopie - beglaubigt)
- Immatrikulationsbescheinigung der zuletzt besuchten Hochschule / Enrolment certification of university last attended
- Nachweis über eine gute Note in Englisch (entsprechend mindestens 10 von 15 Punkten) in einer inländischen Hochschulzugangsberechtigung (Abitur, Fachabitur) (Kopie - beglaubigt) / Evidence of a good grade in English (corresponding to at least 10 of 15 points) as part of a domestic university entrance qualification (Abitur, Fachabitur) (Copy - certified)
- Studienabschlussurkunde (Kopie - beglaubigt) / Diploma (Kopie - beglaubigt)