

# Badges in Education

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# Chapter 1

## Preface

Still to write



## Chapter 2

# Badges in Stack Overflow

## 2.1 The Stack Exchange Network

### 2.1.1 172 Websites with Stack Overflow as Showpiece

Why I am using Stack Overflow as my primary example to investigate the usefulness of badges in education?

Stack Overflow is a very successful Question and Answer (Q&A) website. It hosts the world's largest programming community and is still growing. Stack Overflow occupies about the 60th position in the world rankings of websites. Currently (June 2018) it has 8.9 million registered user with 16 million questions and 25 million answers. There are already clones in different languages (Russian , Japanese, Spanish and Portuguese) whose user basis at least are partially to add.

But Stack Overflow is just the flagship of StackExchange, a network of (currently) 173 Q&A websites, following the same principles for community management. With this high number of Q&A websites for different issues and target groups it is allowed to assume that at least some principles of the successful community management of programmer are not only restricted to technical subjects but can be transferred to other areas as well. One can see from the graphical representation of the Stack Exchange sites that technology, “hard sciences” like mathematics, physics, chemistry dominate the network. But there are also websites on philosophy, language learning and even websites addressing recreational issues like bicycles, chess and beer, wine & spirits.

Stack Exchange network consists of 173 Q&A communities including Stack Overflow, the largest, most trusted online community for developers to learn, share their knowledge, and build their careers. (Quote from the Stack Overflow website) <sup>1</sup>

### 2.1.2 “Graduates” Websites and Websites on Trial (Beta)

### 2.1.3 Stack Exchange Websites by Subject

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<sup>1</sup>This quote appears in a little window when you are on the meta site and you click in the StackExchange banner left from the search field. But actually in my downloaded data I found just 172 websites. On the about site of StackExchange however I have seen outdated information from the year 2015 (Today: 25th May 2018). You can find another summary of the astonishing success story of StackOverflow from a business perspective on the company page of StackOverflow. – It is sometimes difficult for me to find the right place for some information because of the complex clutter of (similar) sites on different levels (site and meta site).

Table 2.1: StockExchange Websites by their Status

| Status | Users    | Sites |
|--------|----------|-------|
| Beta   | 901655   | 93    |
| Normal | 16213271 | 79    |

Table 2.2: Full List of Websites of the StockExchange Network  
(May 25th, 2018)

| #*  | Name                    | Users  | Launched†    | URL   |
|-----|-------------------------|--------|--------------|---|
| 121 | 3D Printing             | 9477   | 2018-04-03 B | <a href="https://3dprinting.stackexchange.com">https://3dprinting.stackexchange.com</a>               |
| 32  | Academia                | 71284  | 2015-02-09 B | <a href="https://academia.stackexchange.com">https://academia.stackexchange.com</a>                   |
| 128 | Amateur Radio           | 7840   | 2015-04-27 B | <a href="https://ham.stackexchange.com">https://ham.stackexchange.com</a>                             |
| 11  | Android Enthusiasts     | 167425 | 2012-09-20   | <a href="https://android.stackexchange.com">https://android.stackexchange.com</a>                     |
| 75  | Anime & Manga           | 21826  | 2017-01-03 B | <a href="https://anime.stackexchange.com">https://anime.stackexchange.com</a>                         |
| 59  | Arduino                 | 34891  | 2013-06-04 B | <a href="https://arduino.stackexchange.com">https://arduino.stackexchange.com</a>                     |
| 19  | Arqade                  | 122227 | 2017-06-06 B | <a href="https://gaming.stackexchange.com">https://gaming.stackexchange.com</a>                       |
| 102 | Artificial Intelligence | 13578  | 2015-05-12 B | <a href="https://ai.stackexchange.com">https://ai.stackexchange.com</a>                               |
| 157 | Arts & Crafts           | 3453   | 2013-10-02 B | <a href="https://crafts.stackexchange.com">https://crafts.stackexchange.com</a>                       |
| 9   | Ask Different           | 204749 | 2016-05-17 B | <a href="https://apple.stackexchange.com">https://apple.stackexchange.com</a>                         |
| 111 | Ask Patents             | 12010  | 2011-03-08 B | <a href="https://patents.stackexchange.com">https://patents.stackexchange.com</a>                     |
| 3   | Ask Ubuntu              | 575722 | 2013-10-29 B | <a href="https://askubuntu.com">https://askubuntu.com</a>   |
| 88  | Astronomy               | 17020  | 2017-02-06 B | <a href="https://astronomy.stackexchange.com">https://astronomy.stackexchange.com</a>                 |
| 171 | Augur                   | 1187   | 2015-11-16   | <a href="https://augur.stackexchange.com">https://augur.stackexchange.com</a>                         |
| 71  | Aviation                | 24031  | 2014-11-10 B | <a href="https://aviation.stackexchange.com">https://aviation.stackexchange.com</a>                   |
| 145 | Beer, Wine & Spirits    | 5387   | 2008-09-15   | <a href="https://alcohol.stackexchange.com">https://alcohol.stackexchange.com</a>                     |
| 106 | Biblical Hermeneutics   | 13028  | 2011-04-05 B | <a href="https://hermeneutics.stackexchange.com">https://hermeneutics.stackexchange.com</a>           |
| 68  | Bicycles                | 26469  | 2015-04-23 B | <a href="https://bicycles.stackexchange.com">https://bicycles.stackexchange.com</a>                   |
| 161 | Bioinformatics          | 2729   | 2011-01-12   | <a href="https://bioinformatics.stackexchange.com">https://bioinformatics.stackexchange.com</a>       |
| 65  | Biology                 | 30513  | 2011-05-31 B | <a href="https://biology.stackexchange.com">https://biology.stackexchange.com</a>                     |
| 37  | Bitcoin                 | 58418  | 2017-06-13 B | <a href="https://bitcoin.stackexchange.com">https://bitcoin.stackexchange.com</a>                     |
| 51  | Blender                 | 42071  | 2015-11-16   | <a href="https://blender.stackexchange.com">https://blender.stackexchange.com</a>                     |
| 82  | Board & Card Games      | 17861  | 2016-07-12 B | <a href="https://boardgames.stackexchange.com">https://boardgames.stackexchange.com</a>               |
| 132 | Bricks                  | 7034   | 2009-05-26   | <a href="https://bricks.stackexchange.com">https://bricks.stackexchange.com</a>                       |
| 130 | Buddhism                | 7599   | 2011-12-13   | <a href="https://buddhism.stackexchange.com">https://buddhism.stackexchange.com</a>                   |
| 49  | Chemistry               | 42183  | 2011-03-21   | <a href="https://chemistry.stackexchange.com">https://chemistry.stackexchange.com</a>                 |
| 105 | Chess                   | 13169  | 2015-07-06 B | <a href="https://chess.stackexchange.com">https://chess.stackexchange.com</a>                         |
| 110 | Chinese Language        | 12215  | 2010-10-28   | <a href="https://chinese.stackexchange.com">https://chinese.stackexchange.com</a>                     |
| 78  | Christianity            | 21118  | 2012-06-26 B | <a href="https://christianity.stackexchange.com">https://christianity.stackexchange.com</a>           |
| 152 | CiviCRM                 | 4503   | 2013-02-05 B | <a href="https://civicrm.stackexchange.com">https://civicrm.stackexchange.com</a>                     |
| 13  | Code Review             | 145633 | 2013-10-08 B | <a href="https://codereview.stackexchange.com">https://codereview.stackexchange.com</a>               |
| 146 | Coffee                  | 5278   | 2014-12-16 B | <a href="https://coffee.stackexchange.com">https://coffee.stackexchange.com</a>                       |
| 159 | Community Building      | 3076   | 2013-03-12 B | <a href="https://communitybuilding.stackexchange.com">https://communitybuilding.stackexchange.com</a> |
| 80  | Computational Science   | 19505  | 2015-09-09   | <a href="https://scicomp.stackexchange.com">https://scicomp.stackexchange.com</a>                     |
| 136 | Computer Graphics       | 6493   | 2012-03-21   | <a href="https://computergraphics.stackexchange.com">https://computergraphics.stackexchange.com</a>   |
| 31  | Computer Science        | 71485  | 2015-07-14   | <a href="https://cs.stackexchange.com">https://cs.stackexchange.com</a>                               |



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| #*  | Name                               | Users  | Launched†    | URL   |
|-----|------------------------------------|--------|--------------|---|
| 148 | Computer Science Educators         | 5135   | 2015-12-11   | <a href="https://cseducators.stackexchange.com">https://cseducators.stackexchange.com</a>           |
| 172 | Constructed Languages              | 627    | 2010-11-25 B | <a href="https://conlang.stackexchange.com">https://conlang.stackexchange.com</a>                   |
| 139 | Craft CMS                          | 5770   | 2015-09-09   | <a href="https://craftcms.stackexchange.com">https://craftcms.stackexchange.com</a>                 |
| 12  | Cross Validated                    | 164454 | 2010-10-10   | <a href="https://stats.stackexchange.com">https://stats.stackexchange.com</a>                       |
| 46  | Cryptography                       | 43965  | 2014-04-22 B | <a href="https://crypto.stackexchange.com">https://crypto.stackexchange.com</a>                     |
| 52  | Data Science                       | 41510  | 2015-02-02 B | <a href="https://datascience.stackexchange.com">https://datascience.stackexchange.com</a>           |
| 18  | Database Administrators            | 124285 | 2011-08-02   | <a href="https://dba.stackexchange.com">https://dba.stackexchange.com</a>                           |
| 134 | DevOps                             | 6932   | 2015-11-16   | <a href="https://devops.stackexchange.com">https://devops.stackexchange.com</a>                     |
| 41  | Drupal Answers                     | 52683  | 2015-06-30   | <a href="https://drupal.stackexchange.com">https://drupal.stackexchange.com</a>                     |
| 126 | Earth Science                      | 8181   | 2012-04-11   | <a href="https://earthscience.stackexchange.com">https://earthscience.stackexchange.com</a>         |
| 129 | Ebooks                             | 7664   | 2014-09-10   | <a href="https://ebooks.stackexchange.com">https://ebooks.stackexchange.com</a>                     |
| 108 | Economics                          | 12409  | 2013-10-22 B | <a href="https://economics.stackexchange.com">https://economics.stackexchange.com</a>               |
| 16  | Electrical Engineering             | 133735 | 2014-01-28 B | <a href="https://electronics.stackexchange.com">https://electronics.stackexchange.com</a>           |
| 114 | elementary OS                      | 11469  | 2012-12-18 B | <a href="https://elementaryos.stackexchange.com">https://elementaryos.stackexchange.com</a>         |
| 101 | Emacs                              | 13909  | 2015-09-09   | <a href="https://emacs.stackexchange.com">https://emacs.stackexchange.com</a>                       |
| 95  | Engineering                        | 15054  | 2009-06-28   | <a href="https://engineering.stackexchange.com">https://engineering.stackexchange.com</a>           |
| 8   | English Language & Usage           | 213136 | 2016-08-23 B | <a href="https://english.stackexchange.com">https://english.stackexchange.com</a>                   |
| 38  | English Language Learners          | 57950  | 2018-02-27 B | <a href="https://ell.stackexchange.com">https://ell.stackexchange.com</a>                           |
| 170 | Esperanto Language                 | 1292   | 2011-02-14   | <a href="https://esperanto.stackexchange.com">https://esperanto.stackexchange.com</a>               |
| 56  | Ethereum                           | 36102  | 2017-06-26   | <a href="https://ethereum.stackexchange.com">https://ethereum.stackexchange.com</a>                 |
| 127 | Expatriates                        | 8150   | 2012-06-26 B | <a href="https://expatriates.stackexchange.com">https://expatriates.stackexchange.com</a>           |
| 141 | ExpressionEngine® Answers          | 5582   | 2013-07-22 B | <a href="https://expressionengine.stackexchange.com">https://expressionengine.stackexchange.com</a> |
| 96  | Freelancing                        | 14864  | 2012-05-08   | <a href="https://freelancing.stackexchange.com">https://freelancing.stackexchange.com</a>           |
| 99  | French Language                    | 14380  | 2015-01-28   | <a href="https://french.stackexchange.com">https://french.stackexchange.com</a>                     |
| 24  | Game Development                   | 88706  | 2011-11-01 B | <a href="https://gamedev.stackexchange.com">https://gamedev.stackexchange.com</a>                   |
| 112 | Gardening & Landscaping            | 11967  | 2011-02-24   | <a href="https://gardening.stackexchange.com">https://gardening.stackexchange.com</a>               |
| 149 | Genealogy & Family History         | 4892   | 2017-05-17   | <a href="https://genealogy.stackexchange.com">https://genealogy.stackexchange.com</a>               |
| 23  | Geographic Information Systems     | 89486  | 2010-10-26 B | <a href="https://gis.stackexchange.com">https://gis.stackexchange.com</a>                           |
| 77  | German Language                    | 21206  | 2017-12-20 B | <a href="https://german.stackexchange.com">https://german.stackexchange.com</a>                     |
| 27  | Graphic Design                     | 83771  | 2012-05-15 B | <a href="https://graphicdesign.stackexchange.com">https://graphicdesign.stackexchange.com</a>       |
| 133 | Hardware Recommendations           | 6946   | 2011-09-13   | <a href="https://hardwarerecs.stackexchange.com">https://hardwarerecs.stackexchange.com</a>         |
| 117 | Health                             | 9923   | 2011-02-14 B | <a href="https://health.stackexchange.com">https://health.stackexchange.com</a>                     |
| 120 | Hinduism                           | 9579   | 2016-12-12   | <a href="https://hinduism.stackexchange.com">https://hinduism.stackexchange.com</a>                 |
| 79  | History                            | 20959  | 2013-11-19 B | <a href="https://history.stackexchange.com">https://history.stackexchange.com</a>                   |
| 138 | History of Science and Mathematics | 6050   | 2011-05-10 B | <a href="https://hsm.stackexchange.com">https://hsm.stackexchange.com</a>                           |

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| #*  | Name                                  | Users  | Launched†    | URL   |
|-----|---------------------------------------|--------|--------------|---|
| 39  | Home Improvement                      | 56323  | 2014-06-18 B | <a href="https://diy.stackexchange.com">https://diy.stackexchange.com</a>                               |
| 123 | Homebrewing                           | 8603   | 2016-05-09 B | <a href="https://homebrew.stackexchange.com">https://homebrew.stackexchange.com</a>                     |
| 14  | Information Security                  | 139812 | 2017-08-22 B | <a href="https://security.stackexchange.com">https://security.stackexchange.com</a>                     |
| 137 | Internet of Things                    | 6283   | 2010-12-16   | <a href="https://iot.stackexchange.com">https://iot.stackexchange.com</a>                               |
| 92  | Interpersonal Skills                  | 15739  | 2010-10-25   | <a href="https://interpersonal.stackexchange.com">https://interpersonal.stackexchange.com</a>           |
| 165 | Iota                                  | 1957   | 2010-12-14 B | <a href="https://iota.stackexchange.com">https://iota.stackexchange.com</a>                             |
| 91  | Islam                                 | 16009  | 2012-07-17   | <a href="https://islam.stackexchange.com">https://islam.stackexchange.com</a>                           |
| 153 | Italian Language                      | 4144   | 2010-11-11   | <a href="https://italian.stackexchange.com">https://italian.stackexchange.com</a>                       |
| 84  | Japanese Language                     | 17704  | 2016-03-15 B | <a href="https://japanese.stackexchange.com">https://japanese.stackexchange.com</a>                     |
| 135 | Joomla                                | 6613   | 2016-10-17 B | <a href="https://joomla.stackexchange.com">https://joomla.stackexchange.com</a>                         |
| 167 | Korean Language                       | 1451   | 2010-10-13   | <a href="https://korean.stackexchange.com">https://korean.stackexchange.com</a>                         |
| 155 | Language Learning                     | 3703   | 2014-02-20   | <a href="https://languagelearning.stackexchange.com">https://languagelearning.stackexchange.com</a>     |
| 162 | Latin Language                        | 2487   | 2012-01-03   | <a href="https://latin.stackexchange.com">https://latin.stackexchange.com</a>                           |
| 103 | Law                                   | 13556  | 2015-06-23   | <a href="https://law.stackexchange.com">https://law.stackexchange.com</a>                               |
| 85  | Lifehacks                             | 17415  | 2016-07-06   | <a href="https://lifehacks.stackexchange.com">https://lifehacks.stackexchange.com</a>                   |
| 109 | Linguistics                           | 12390  | 2016-07-06   | <a href="https://linguistics.stackexchange.com">https://linguistics.stackexchange.com</a>               |
| 158 | Literature                            | 3327   | 2013-01-22   | <a href="https://literature.stackexchange.com">https://literature.stackexchange.com</a>                 |
| 45  | Magento                               | 48512  | 2011-08-30   | <a href="https://magento.stackexchange.com">https://magento.stackexchange.com</a>                       |
| 140 | Martial Arts                          | 5662   | 2013-09-04 B | <a href="https://martialarts.stackexchange.com">https://martialarts.stackexchange.com</a>               |
| 53  | Mathematica                           | 39336  | 2010-11-22   | <a href="https://mathematica.stackexchange.com">https://mathematica.stackexchange.com</a>               |
| 4   | Mathematics                           | 443045 | 2011-03-24   | <a href="https://math.stackexchange.com">https://math.stackexchange.com</a>                             |
| 131 | Mathematics<br>Educators              | 7240   | 2010-10-14   | <a href="https://matheducators.stackexchange.com">https://matheducators.stackexchange.com</a>           |
| 28  | MathOverflow                          | 80803  | 2011-12-21 B | <a href="https://mathoverflow.net">https://mathoverflow.net</a>   |
| 10  | Meta Stack Exchange                   | 204039 | 2011-01-28   | <a href="https://meta.stackexchange.com">https://meta.stackexchange.com</a>                             |
| 119 | Mi Yodeya                             | 9801   | 2016-05-04   | <a href="https://judaism.stackexchange.com">https://judaism.stackexchange.com</a>                       |
| 144 | Monero                                | 5421   | 2010-05-20   | <a href="https://monero.stackexchange.com">https://monero.stackexchange.com</a>                         |
| 67  | Motor Vehicle<br>Maintenance & Repair | 26754  | 2015-09-29 B | <a href="https://mechanics.stackexchange.com">https://mechanics.stackexchange.com</a>                   |
| 48  | Movies & TV                           | 43634  | 2014-12-01 B | <a href="https://movies.stackexchange.com">https://movies.stackexchange.com</a>                         |
| 142 | Music Fans                            | 5507   | 2011-11-22 B | <a href="https://musicfans.stackexchange.com">https://musicfans.stackexchange.com</a>                   |
| 60  | Music: Practice &<br>Theory           | 33576  | 2011-08-24 B | <a href="https://music.stackexchange.com">https://music.stackexchange.com</a>                           |
| 154 | Mythology & Folklore                  | 3771   | 2012-01-31 B | <a href="https://mythology.stackexchange.com">https://mythology.stackexchange.com</a>                   |
| 57  | Network Engineering                   | 35568  | 2014-03-18 B | <a href="https://networkengineering.stackexchange.com">https://networkengineering.stackexchange.com</a> |
| 93  | Open Data                             | 15236  | 2014-03-25 B | <a href="https://opendata.stackexchange.com">https://opendata.stackexchange.com</a>                     |
| 118 | Open Source                           | 9848   | 2012-01-25 B | <a href="https://opensource.stackexchange.com">https://opensource.stackexchange.com</a>                 |
| 76  | Parenting                             | 21452  | 2017-07-18 B | <a href="https://parenting.stackexchange.com">https://parenting.stackexchange.com</a>                   |
| 43  | Personal Finance &<br>Money           | 48756  | 2011-08-16   | <a href="https://money.stackexchange.com">https://money.stackexchange.com</a>                           |
| 122 | Pets                                  | 8614   | 2015-11-17   | <a href="https://pets.stackexchange.com">https://pets.stackexchange.com</a>                             |
| 70  | Philosophy                            | 24934  | 2011-10-25 B | <a href="https://philosophy.stackexchange.com">https://philosophy.stackexchange.com</a>                 |
| 44  | Photography                           | 48701  | 2017-03-22 B | <a href="https://photo.stackexchange.com">https://photo.stackexchange.com</a>                           |
| 81  | Physical Fitness                      | 18692  | 2014-04-29 B | <a href="https://fitness.stackexchange.com">https://fitness.stackexchange.com</a>                       |
| 15  | Physics                               | 136988 | 2015-11-16   | <a href="https://physics.stackexchange.com">https://physics.stackexchange.com</a>                       |

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(May 25th, 2018 *(continued)*)

| #*  | Name                                 | Users   | Launched†    | URL   |
|-----|--------------------------------------|---------|--------------|---|
| 151 | Poker                                | 4519    | 2009-08-18   | <a href="https://poker.stackexchange.com">https://poker.stackexchange.com</a>                             |
| 83  | Politics                             | 17739   | 2016-04-26 B | <a href="https://politics.stackexchange.com">https://politics.stackexchange.com</a>                       |
| 160 | Portuguese Language                  | 2816    | 2017-02-28 B | <a href="https://portuguese.stackexchange.com">https://portuguese.stackexchange.com</a>                   |
| 35  | Programming Puzzles & Code Golf      | 61867   | 2015-08-31 B | <a href="https://codegolf.stackexchange.com">https://codegolf.stackexchange.com</a>                       |
| 74  | Project Management                   | 21935   | 2011-07-12   | <a href="https://pm.stackexchange.com">https://pm.stackexchange.com</a>                                   |
| 97  | Psychology & Neuroscience            | 14653   | 2016-08-09 B | <a href="https://psychology.stackexchange.com">https://psychology.stackexchange.com</a>                   |
| 55  | Puzzling                             | 37002   | 2016-09-13 B | <a href="https://puzzling.stackexchange.com">https://puzzling.stackexchange.com</a>                       |
| 73  | Quantitative Finance                 | 22142   | 2010-11-15 B | <a href="https://quant.stackexchange.com">https://quant.stackexchange.com</a>                             |
| 163 | Quantum Computing                    | 2464    | 2017-02-21 B | <a href="https://quantumcomputing.stackexchange.com">https://quantumcomputing.stackexchange.com</a>       |
| 33  | Raspberry Pi                         | 70154   | 2014-08-05 B | <a href="https://raspberrypi.stackexchange.com">https://raspberrypi.stackexchange.com</a>                 |
| 143 | Retrocomputing                       | 5494    | 2012-02-15 B | <a href="https://retrocomputing.stackexchange.com">https://retrocomputing.stackexchange.com</a>           |
| 86  | Reverse Engineering                  | 17346   | 2014-12-22 B | <a href="https://reverseengineering.stackexchange.com">https://reverseengineering.stackexchange.com</a>   |
| 98  | Robotics                             | 14415   | 2016-09-13   | <a href="https://robotics.stackexchange.com">https://robotics.stackexchange.com</a>                       |
| 62  | Role-playing Games                   | 31354   | 2011-06-15 B | <a href="https://rpg.stackexchange.com">https://rpg.stackexchange.com</a>                                 |
| 125 | Russian Language                     | 8424    | 2012-11-06 B | <a href="https://russian.stackexchange.com">https://russian.stackexchange.com</a>                         |
| 116 | Russian Language in Russian          | 10432   | 2016-02-23   | <a href="https://rus.stackexchange.com">https://rus.stackexchange.com</a>                                 |
| 54  | Salesforce                           | 39321   | 2015-09-08   | <a href="https://salesforce.stackexchange.com">https://salesforce.stackexchange.com</a>                   |
| 30  | Science Fiction & Fantasy            | 73633   | 2015-04-07 B | <a href="https://scifi.stackexchange.com">https://scifi.stackexchange.com</a>                             |
| 47  | Seasoned Advice                      | 43770   | 2013-12-24 B | <a href="https://cooking.stackexchange.com">https://cooking.stackexchange.com</a>                         |
| 5   | Server Fault                         | 365338  | 2015-08-25   | <a href="https://serverfault.com">https://serverfault.com</a>   |
| 42  | SharePoint                           | 49985   | 2017-07-10   | <a href="https://sharepoint.stackexchange.com">https://sharepoint.stackexchange.com</a>                   |
| 66  | Signal Processing                    | 27399   | 2014-04-02   | <a href="https://dsp.stackexchange.com">https://dsp.stackexchange.com</a>                                 |
| 156 | Sitecore                             | 3518    | 2010-11-30   | <a href="https://sitecore.stackexchange.com">https://sitecore.stackexchange.com</a>                       |
| 64  | Skeptics                             | 30847   | 2011-03-07   | <a href="https://skeptics.stackexchange.com">https://skeptics.stackexchange.com</a>                       |
| 7   | Software Engineering                 | 254061  | 2010-10-06   | <a href="https://softwareengineering.stackexchange.com">https://softwareengineering.stackexchange.com</a> |
| 69  | Software Quality Assurance & Testing | 26168   | 2014-06-30 B | <a href="https://sqa.stackexchange.com">https://sqa.stackexchange.com</a>                                 |
| 63  | Software Recommendations             | 31238   | 2012-10-16 B | <a href="https://softwarerecs.stackexchange.com">https://softwarerecs.stackexchange.com</a>               |
| 107 | Sound Design                         | 12475   | 2014-02-26   | <a href="https://sound.stackexchange.com">https://sound.stackexchange.com</a>                             |
| 87  | Space Exploration                    | 17212   | 2011-09-20 B | <a href="https://space.stackexchange.com">https://space.stackexchange.com</a>                             |
| 113 | Spanish Language                     | 11884   | 2012-01-24 B | <a href="https://spanish.stackexchange.com">https://spanish.stackexchange.com</a>                         |
| 124 | Sports                               | 8524    | 2013-04-01 B | <a href="https://sports.stackexchange.com">https://sports.stackexchange.com</a>                           |
| 58  | Stack Apps                           | 35141   | 2015-01-14   | <a href="https://stackapps.com">https://stackapps.com</a>   |
| 1   | Stack Overflow                       | 8883496 | 2016-02-01 B | <a href="https://stackoverflow.com">https://stackoverflow.com</a>   |
| 89  | Stack Overflow in Japanese           | 16868   | 2015-09-01   | <a href="https://ja.stackoverflow.com">https://ja.stackoverflow.com</a>                                   |
| 26  | Stack Overflow in Portuguese         | 86100   | 2015-05-13   | <a href="https://pt.stackoverflow.com">https://pt.stackoverflow.com</a>                                   |
| 20  | Stack Overflow in Russian            | 118769  | 2015-05-20   | <a href="https://ru.stackoverflow.com">https://ru.stackoverflow.com</a>                                   |

Table 2.2: Full List of Websites of the StockExchange Network  
(May 25th, 2018 *(continued)*)

| #*  | Name                         | Users  | Launched†    | URL   |
|-----|------------------------------|--------|--------------|---|
| 29  | Stack Overflow in Spanish    | 78683  | 2013-05-29   | <a href="https://es.stackoverflow.com">https://es.stackoverflow.com</a>                         |
| 169 | Stellar                      | 1359   | 2015-03-30 B | <a href="https://stellar.stackexchange.com">https://stellar.stackexchange.com</a>               |
| 2   | Super User                   | 638973 | 2014-04-23   | <a href="https://superuser.com">https://superuser.com</a>                                       |
| 147 | Sustainable Living           | 5148   | 2015-05-18   | <a href="https://sustainability.stackexchange.com">https://sustainability.stackexchange.com</a> |
| 17  | TeX - LaTeX                  | 131516 | 2011-10-11 B | <a href="https://tex.stackexchange.com">https://tex.stackexchange.com</a>                       |
| 115 | The Great Outdoors           | 10704  | 2015-07-27 B | <a href="https://outdoors.stackexchange.com">https://outdoors.stackexchange.com</a>             |
| 36  | The Workplace                | 61634  | 2015-08-18   | <a href="https://workplace.stackexchange.com">https://workplace.stackexchange.com</a>           |
| 61  | Theoretical Computer Science | 33286  | 2010-10-21   | <a href="https://cstheory.stackexchange.com">https://cstheory.stackexchange.com</a>             |
| 100 | Tor                          | 14113  | 2015-03-10 B | <a href="https://tor.stackexchange.com">https://tor.stackexchange.com</a>                       |
| 40  | Travel                       | 55032  | 2010-11-04   | <a href="https://travel.stackexchange.com">https://travel.stackexchange.com</a>                 |
| 164 | Tridion                      | 2148   | 2015-02-19 B | <a href="https://tridion.stackexchange.com">https://tridion.stackexchange.com</a>               |
| 168 | Ukrainian Language           | 1431   | 2012-05-01 B | <a href="https://ukrainian.stackexchange.com">https://ukrainian.stackexchange.com</a>           |
| 6   | Unix & Linux                 | 256909 | 2017-07-17   | <a href="https://unix.stackexchange.com">https://unix.stackexchange.com</a>                     |
| 25  | User Experience              | 87501  | 2014-06-24 B | <a href="https://ux.stackexchange.com">https://ux.stackexchange.com</a>                         |
| 166 | Vegetarianism                | 1492   | 2010-09-30   | <a href="https://vegetarianism.stackexchange.com">https://vegetarianism.stackexchange.com</a>   |
| 90  | Vi and Vim                   | 16276  | 2012-02-07 B | <a href="https://vi.stackexchange.com">https://vi.stackexchange.com</a>                         |
| 94  | Video Production             | 15206  | 2009-09-28   | <a href="https://video.stackexchange.com">https://video.stackexchange.com</a>                   |
| 21  | Web Applications             | 117232 | 2017-10-09   | <a href="https://webapps.stackexchange.com">https://webapps.stackexchange.com</a>               |
| 34  | Webmasters                   | 67201  | 2011-12-06 B | <a href="https://webmasters.stackexchange.com">https://webmasters.stackexchange.com</a>         |
| 104 | Windows Phone                | 13481  | 2013-05-21 B | <a href="https://windowsphone.stackexchange.com">https://windowsphone.stackexchange.com</a>     |
| 150 | Woodworking                  | 4827   | 2018-02-06 B | <a href="https://woodworking.stackexchange.com">https://woodworking.stackexchange.com</a>       |
| 22  | WordPress Development        | 108426 | 2015-06-16   | <a href="https://wordpress.stackexchange.com">https://wordpress.stackexchange.com</a>           |
| 50  | Worldbuilding                | 42090  | 2015-07-14 B | <a href="https://worldbuilding.stackexchange.com">https://worldbuilding.stackexchange.com</a>   |
| 72  | Writing                      | 23139  | 2011-03-03   | <a href="https://writing.stackexchange.com">https://writing.stackexchange.com</a>               |

\* # = rank according to number of users

† B = launch date of open beta, e.g. site is still in beta

## 2.2 Dynamics of the Stack Exchange Community

But before to look into these other websites one should grasp the community dynamics of the most successful member of the network.

All Stack Exchange websites are based of a complex interplay between different elements:

1. **Scores (“reputation” points)** are earned through positive votes by peers for posting useful answers but also for asking questions, if they show research effort and their underlying problems are reproducible.
2. **Badges** as digital token in form of emblems. They are awarded by the system either for fulfilling certain tasks or reaching a certain amount of community awareness.
3. **Privileges** are granted when certain thresholds or milestones of reputation points are transcended. Each privilege opens up a specified user rights in relation to the website.

I am convinced that the study of user interactions of Stack Overflow can be very helpful to understand the success factors for a prosperous community building process. To study user behavior and their reactions to

the rules and framework of Stack Overflow one can learn not only much about the effects of gamification elements (e.g. the interplay between reputation points and badges) but also how communities of practice work.

Besides the common review of literature my research in this paper is based on four sources:

1. **Stack Overflow:** Clearly enough this has to be one of my chief source of information.
2. **Stack Exchange API:** The Stack Exchange network provides an Application Programming Interface (API) where one can download data for answering research question.
3. **Meta Stack Overflow:** This website is especially dedicated to Q&A *about* Stack Overflow itself. The discussion on this website is an important resource on qualitative data to my research question.
4. **Meta Stack Exchange:** Another for meta-discussion. This time for the whole Stack Exchange family of Q&A websites, so to speak the meta-meta-website of the Stack Overflow website.

## 2.3 Categorization of Badges

I need to download all types of badges with their description and for further investigation to categorize them.

### 2.3.1 Badges for different activities

The badges are grouped according to the necessary activities to get them. The long version what you have to do to get a specific badge is posted on [meta.stackexchange.com](http://meta.stackexchange.com) under the title: List of all badges with full descriptions. A short and more readable version can be seen on help page for badges:

- 1) Question badges
- 2) Answer badges
- 3) Participation badges
- 4) Moderation badges
- 5) Other badges
- 6) Documentation badges

### 2.3.2 Badges from different sources

Another differentiation is the point of origin the badges come from. Even though all badges are generated automatically by the system, there are two principal sources to get them. There are two different entities responsible for awarding badges.

- There are badges you can get by just doing a certain action once or a needed number of times. \* And there are badges you get only after some community action.

I call the first type **user** and the second type **peer** badges.

#### Examples for user badges:

- Name: “Civic Duty” (Vote 300 times).
- Name: “Enthusiast” (Visit the site each day for 30 consecutive day)

Some of the **user** badges are only available after some threshold value is reached and a certain privileges is granted. For instance voting up needs 15 and voting down 125 reputation points.

#### Examples for peer badges:

- Name: “Favorite Question” (Question favored by 25 users)
- Name: “Popular Question” (Question with 1000 views).

There are also badges tied with certain events, like moderator election, working with the beta version, meeting employees at an event etc. Mostly these badges are in my categorization **user** badges, but you cannot get them at any time, even if you would have the required privileges.

The badge system of Stack Overflow is a dynamic system. When the website was launched (September 15, 2008) it did not start with all 91 badges which are listed today (May 21, 2018). Some of the badges were added during the history of the website but other are not awarded anymore. Some of those badges which are not functional anymore are retired badges (e.g. “Analytical”, for visiting all sections of the FAQ). This means you will still see some veteran users with these badges. Other badges (all three documentation badges for instance) are withdrawn, e.g. they were even deleted from those user accounts they were awarded earlier. I call these two groups of badges **event** and **dead** badges.

To sum up there are 4 points of origin for badges:

- 1) Badges from user action = **user** badges
- 2) Badges from community action = **peer** badges
- 3) Badges from some action during a specified occurrence = **event** badges
- 4) Badges where the point of origin is not interesting anymore as they are now non-functional = **dead** badges

### 2.3.3 Badges with different degrees of difficulty

Badges are ranked by their difficulty. According to their level of difficulty users are awarded with bronze (relatively easy), silver (moderately difficult) or gold (difficult) badges.

There are badges with the same action required but with different amount of repetition. User can see those groups of badges separated by lines on the Stack Overflow website. On this page one can also inspect how many time each badge was awarded.

There is also a special group of badges intimately linked with reputation of the user’s expertise. These **Tag Badges** also come with different degrees of difficulty.

I will focus in my research on those badges where users are mainly responsible. Those are the badges where I can show if users are motivated to strive for them.

**Visit the site each day for [...] consecutive days. (Days are counted in UTC.)**

- 30 (Enthusiast)
- 100 (Fanatic)

**Ask a well-received question [...] and maintain a positive question record**

- on 5 separate days (Curious)
- on 30 separate days (Inquisitativ)
- on 100 separate days (Socratic)

**Complete at least [...]. This badge is awarded once per review type**

- one review task (Custodian)
- 250 review tasks (Reviewer)
- 1000 review tasks (Steward)

**Edit and answer [...] (both actions within 12 hours, answer score > 0)**

- 1 question (Explainer)
- 50 questions (Refiner)
- 500 questions (Illuminator)

**Edit**

- first post (Editor)

- 80 posts (Strunk & White)
- 500 posts (Copy Editor)

**Edit [...] that was inactive for 6 months**

- first post (Excavator)
- 100 posts (Archaeologist)

The **user** badges are of utmost importance for my research. Most of these badges are granted for quality assurance work on the website and are not linked with reputation points. They are – from a systemic perspective – important for the dynamic of the website and maintain respectively raise the quality of the platform and their ecological sustainability.

When I can show that people are striving to get **user** badges – even when they are not linked with reputation points – than it is evident that badges are some additional (motivational) factors for the community development.

Table 2.3: Badges in Stack Overflow

|    | ID   | Name           | Count  | Rank   | Activity      | Origin | Alike | Description  |
|----|------|----------------|--------|--------|---------------|--------|-------|--|
| 1  | 222  | Altruist       | 8158   | bronze | Question      | User   | XX    | First bounty you manually award on another person's question   |
| 2  | 1306 | Analytical     | 43743  | bronze | Other         | Dead   | XX    | Visited every section of the FAQ (retired)   |
| 3  | 260  | Announcer      | 131289 | bronze | Other         | Peer   | 22    | Share a link to a question later visited by 25 unique IP addresses                                       |
| 4  | 1286 | Archaeologist  | 1883   | silver | Moderation    | User   | 20    | Edit 100 posts that were inactive for 6 months   |
| 5  | 9    | Autobiographer | 799567 | bronze | Participation | User   | XX    | Complete "About Me" section of user profile  |
| 6  | 221  | Benefactor     | 38879  | bronze | Question      | User   | XX    | First bounty you manually award on your own question   |
| 7  | 30   | Beta           | 2510   | silver | Participation | Event  | 13    | Voted 10 times, added 3 posts score > 0, and visited the site on 3 separate days during the private beta |
| 8  | 261  | Booster        | 3234   | silver | Other         | Peer   | 22    | Share a link to a question later visited by 300 unique IP addresses                                      |
| 9  | 1973 | Caucus         | 573681 | bronze | Participation | Event  | 09    | Visit an election during any phase of an active election and have enough reputation to cast a vote       |
| 10 | 6644 | Census         | 71168  | silver | Other         | Event  | XX    | Completed the annual Stack Overflow survey; your responses are anonymous                                 |
| 11 | 8    | Citizen Patrol | 177509 | bronze | Moderation    | User   | 16    | First flagged post   |
| 12 | 32   | Civic Duty     | 80312  | silver | Moderation    | User   | XX    | Vote 300 or more times   |
| 13 | 4    | Cleanup        | 40887  | bronze | Moderation    | User   | XX    | First rollback   |
| 14 | 31   | Commentator    | 799870 | bronze | Participation | User   | 10    | Leave 10 comments  |
| 15 | 3108 | Constable      | 0      | gold   | Moderation    | Event  | 17    | Served as a pro-tem moderator for at least 1 year or through site graduation                             |
| 16 | 1974 | Constituent    | 186464 | silver | Participation | Event  | 09    | Vote for a candidate in the final phase of an election   |
| 17 | 901  | Convention     | 2041   | silver | Participation | Peer   | 14    | 10 posts with score of 2 on meta   |
| 18 | 223  | Copy Editor    | 2807   | gold   | Moderation    | User   | 19    | Edit 500 posts (excluding own or deleted posts and tag edits)  |
| 19 | 7    | Critic         | 337868 | bronze | Moderation    | User   | XX    | First down vote  |
| 20 | 4127 | Curious        | 283493 | bronze | Question      | User   | 01    | Ask a well-received question on 5 separate days, and maintain a positive question record                 |
| 21 | 2278 | Custodian      | 660176 | bronze | Moderation    | User   | 18    | Complete at least one review task. This badge is awarded once per review type                            |
| 22 | 1002 | Deputy         | 10655  | silver | Moderation    | User   | 16    | Raise 80 helpful flags   |



Table 2.3: Badges in Stack Overflow (*continued*)

|    | ID   | Name                  | Count   | Rank   | Activity      | Origin | Alike | Description  |
|----|------|-----------------------|---------|--------|---------------|--------|-------|--|
| 23 | 37   | Disciplined           | 10866   | bronze | Moderation    | User   | XX    | Delete own post with score of 3 or higher  |
| 24 | 6157 | Documentation Beta    | 294     | silver | Documentation | Dead   | XX    | Contributed 3+ substantive pieces of documentation during the private beta             |
| 25 | 6158 | Documentation Pioneer | 2359    | silver | Documentation | Dead   | XX    | Contributed 3+ substantive pieces of documentation in the first month of documentation |
| 26 | 7358 | Documentation User    | 43292   | silver | Documentation | Dead   | XX    | Earned at least one badge for contributing to Stack Overflow Documentation             |
| 27 | 3    | Editor                | 1941240 | bronze | Moderation    | User   | 19    | First edit   |
| 28 | 155  | Electorate            | 17053   | gold   | Moderation    | User   | XX    | Vote on 600 questions and 25% or more of total votes are on questions                  |
| 29 | 19   | Enlightened           | 326889  | silver | Answer        | Peer   | XX    | First to answer and accepted with score of 10 or more                                  |
| 30 | 71   | Enthusiast            | 184881  | silver | Participation | User   | 11    | Visit the site each day for 30 consecutive days. (Days are counted in UTC.)            |
| 31 | 145  | Epic                  | 659     | silver | Participation | Peer   | 12    | Earn 200 daily reputation 50 times   |
| 32 | 1287 | Excavator             | 116182  | bronze | Moderation    | User   | 20    | Edit first post that was inactive for 6 months   |
| 33 | 4368 | Explainer             | 55984   | bronze | Answer        | User   | 05    | Edit and answer 1 question (both actions within 12 hours, answer score > 0)            |
| 34 | 28   | Famous Question       | 531146  | gold   | Question      | Peer   | 04    | Question with 10,000 views   |
| 35 | 83   | Fanatic               | 28042   | gold   | Participation | User   | 11    | Visit the site each day for 100 consecutive days. (Days are counted in UTC.)           |
| 36 | 33   | Favorite Question     | 42126   | silver | Question      | Peer   | 02    | Question favorited by 25 users   |
| 37 | 15   | Generalist            | 1018    | silver | Answer        | Peer   | XX    | Provide non-wiki answers of 15 total score in 20 of top 40 tags                        |
| 38 | 24   | Good Answer           | 338757  | silver | Answer        | Peer   | 06    | Answer score of 25 or more   |
| 39 | 21   | Good Question         | 158537  | silver | Question      | Peer   | 03    | Question score of 25 or more   |
| 40 | 25   | Great Answer          | 58424   | gold   | Answer        | Peer   | 06    | Answer score of 100 or more  |
| 41 | 22   | Great Question        | 26490   | gold   | Question      | Peer   | 03    | Question score of 100 or more  |

Table 2.3: Badges in Stack Overflow (*continued*)

|    | ID   | Name             | Count   | Rank   | Activity      | Origin | Alike | Description  |
|----|------|------------------|---------|--------|---------------|--------|-------|--|
| 42 | 18   | Guru             | 107423  | silver | Answer        | Peer   | XX    | Accepted answer and score of 40 or more  |
| 43 | 4370 | Illuminator      | 92      | gold   | Answer        | User   | 05    | Edit and answer 500 questions (both actions within 12 hours, answer score > 0)   |
| 44 | 2600 | Informed         | 1728997 | bronze | Other         | User   | XX    | Read the entire tour page  |
| 45 | 4128 | Inquisitive      | 28311   | silver | Question      | User   | 01    | Ask a well-received question on 30 separate days, and maintain a positive question record                                |
| 46 | 219  | Investor         | 16376   | bronze | Question      | User   | XX    | First bounty you offer on another person's question  |
| 47 | 146  | Legendary        | 250     | gold   | Participation | Peer   | 12    | Earn 200 daily reputation 150 times  |
| 48 | 1298 | Marshal          | 2512    | gold   | Moderation    | User   | 16    | Raise 500 helpful flags  |
| 49 | 144  | Mortarboard      | 29156   | bronze | Participation | Peer   | 12    | Earn at least 200 reputation (the daily maximum) in a single day   |
| 50 | 17   | Necromancer      | 451138  | silver | Answer        | Peer   | 07    | Answer a question more than 60 days later with score of 5 or more  |
| 51 | 23   | Nice Answer      | 1020981 | bronze | Answer        | Peer   | 06    | Answer score of 10 or more   |
| 52 | 20   | Nice Question    | 491031  | bronze | Question      | Peer   | 03    | Question score of 10 or more   |
| 53 | 6381 | Not a Robot      | 892     | silver | Other         | Event  | XX    | Met a Stack Overflow employee at an event where Stack Overflow was an organizer or participant with 50 or more attendees |
| 54 | 27   | Notable Question | 1859667 | silver | Question      | Peer   | 04    | Question with 2,500 views  |
| 55 | 5    | Organizer        | 111063  | bronze | Moderation    | User   | XX    | First retag  |
| 56 | 998  | Outspoken        | 1156    | silver | Participation | Peer   | 15    | Post 10 messages in chat starred by 10 different users   |
| 57 | 38   | Peer Pressure    | 186488  | bronze | Moderation    | User   | XX    | Delete own post with score of -3 or lower  |
| 58 | 26   | Popular Question | 3725497 | bronze | Question      | Peer   | 04    | Question with 1,000 views  |
| 59 | 62   | Populist         | 16770   | gold   | Answer        | Peer   | XX    | Highest scoring answer that outscored an accepted answer with score of more than 10 by more than 2x                      |
| 60 | 892  | Precognitive     | 0       | bronze | Participation | Dead   | 13    | Followed the Area 51 proposal for this site before it entered the commitment phase                                       |
| 61 | 220  | Promoter         | 69063   | bronze | Question      | User   | XX    | First bounty you offer on your own question  |
| 62 | 1276 | Proofreader      | 16465   | bronze | Moderation    | User   | XX    | Approve or reject 100 suggested edits  |

Table 2.3: Badges in Stack Overflow (*continued*)

|    | ID   | Name               | Count   | Rank   | Activity      | Origin | Alike | Description  |
|----|------|--------------------|---------|--------|---------------|--------|-------|--|
| 63 | 262  | Publicist          | 953     | gold   | Other         | Peer   | 22    | Share a link to a question later visited by 1000 unique IP addresses                       |
| 64 | 94   | Pundit             | 9207    | silver | Participation | Peer   | 10    | Leave 10 comments with score of 5 or more  |
| 65 | 900  | Quorum             | 25227   | bronze | Participation | Peer   | 14    | One post with score of 2 on meta   |
| 66 | 4369 | Refiner            | 1774    | silver | Answer        | User   | 05    | Edit and answer 50 questions (both actions within 12 hours, answer score > 0)              |
| 67 | 1656 | Research Assistant | 280     | silver | Moderation    | User   | 21    | Edit 50 tag wikis  |
| 68 | 95   | Reversal           | 291     | gold   | Answer        | Peer   | XX    | Provide an answer of +20 score to a question of -5 score                                   |
| 69 | 1478 | Reviewer           | 33425   | silver | Moderation    | User   | 18    | Complete at least 250 review tasks. This badge is awarded once per review type             |
| 70 | 837  | Revival            | 324339  | bronze | Answer        | User   | 07    | Answer more than 30 days after a question was asked as first answer scoring 2 or more      |
| 71 | 10   | Scholar            | 1597231 | bronze | Question      | User   | XX    | Ask a question and accept an answer  |
| 72 | 14   | Self-Learner       | 122119  | bronze | Answer        | User   | XX    | Answer your own question with score of 3 or more   |
| 73 | 3109 | Sheriff            | 36      | gold   | Moderation    | Event  | 17    | Served as an elected moderator for at least 1 year   |
| 74 | 4129 | Socratic           | 3362    | gold   | Question      | User   | 01    | Ask a well-received question on 100 separate days, and maintain a positive question record |
| 75 | 805  | Sportsmanship      | 2572    | silver | Moderation    | User   | XX    | Up vote 100 answers on questions where an answer of yours has a positive score             |
| 76 | 36   | Stellar Question   | 6046    | gold   | Question      | Peer   | 02    | Question favorited by 100 users  |
| 77 | 2279 | Steward            | 11887   | gold   | Moderation    | User   | 18    | Complete at least 1,000 review tasks. This badge is awarded once per review type           |
| 78 | 12   | Strunk & White     | 14705   | silver | Moderation    | User   | 19    | Edit 80 posts  |
| 79 | 2    | Student            | 1937383 | bronze | Question      | User   | XX    | First question with score of 1 or more   |
| 80 | 804  | Suffrage           | 43785   | bronze | Moderation    | User   | XX    | Use 30 votes in a day  |
| 81 | 6    | Supporter          | 1168643 | bronze | Moderation    | User   | XX    | First up vote  |
| 82 | 1224 | Synonymizer        | 899     | bronze | Moderation    | Peer   | XX    | First approved tag synonym   |
| 83 | 254  | Tag Editor         | 21974   | bronze | Moderation    | User   | 21    | First tag wiki edit  |
| 84 | 884  | Talkative          | 9613    | bronze | Participation | Peer   | 15    | Post 10 messages, with 1 or more starred, in chat  |

Table 2.3: Badges in Stack Overflow (*continued*)

|    | ID   | Name        | Count   | Rank   | Activity      | Origin | Alike | Description   |
|----|------|-------------|---------|--------|---------------|--------|-------|---|
| 85 | 11   | Taxonomist  | 11747   | silver | Moderation    | Peer   | XX    | Create a tag used by 50 questions   |
| 86 | 1    | Teacher     | 1266655 | bronze | Answer        | User   | XX    | Answer a question with score of 1 or more   |
| 87 | 225  | Tenacious   | 48183   | silver | Answer        | User   | 08    | Zero score accepted answers: more than 5 and 20% of total                           |
| 88 | 63   | Tumbleweed  | 998633  | bronze | Question      | Peer   | XX    | Asked a question with zero score, no answers, no comments, and low views for a week |
| 89 | 226  | Unsung Hero | 18860   | gold   | Answer        | Peer   | 08    | Zero score accepted answers: more than 10 and 25% of total                          |
| 90 | 1108 | Vox Populi  | 28464   | bronze | Moderation    | User   | XX    | Use the maximum 40 votes in a day   |
| 91 | 13   | Yearling    | 1329469 | silver | Participation | Event  | XX    | Active member for a year, earning at least 200 reputation                           |

## Chapter 3

# Introduction

Still to write



## Chapter 4

# Methods

We describe our methods in this chapter.





## Chapter 5

# Applications

Some *significant* applications are demonstrated in this chapter.

### 5.1 Example one

### 5.2 Example two



## Chapter 6

# Final Words

We have finished a nice book.



# Chapter 7

## Appendix

### 7.1 Material from original bookdown files

#### 7.1.1 Prerequisites

This is a *sample* book written in **Markdown**. You can use anything that Pandoc's Markdown supports, e.g., a math equation  $a^2 + b^2 = c^2$ .

The **bookdown** package can be installed from CRAN or Github:

```
> install.packages("bookdown")  
> # or the development version  
> # devtools::install_github("rstudio/bookdown")
```

Remember each Rmd file contains one and only one chapter, and a chapter is defined by the first-level heading #.

To compile this example to PDF, you need XeLaTeX. You are recommended to install TinyTeX (which includes XeLaTeX): <https://yihui.name/tinytex/>.

#### 7.1.2 Intro of the minimal book example

You can label chapter and section titles using {#label} after them, e.g., we can reference Chapter 3. If you do not manually label them, there will be automatic labels anyway, e.g., Chapter 4.

Figures and tables with captions will be placed in **figure** and **table** environments, respectively.

```
> par(mar = c(4, 4, .1, .1))  
> plot(pressure, type = 'b', pch = 19)
```

Reference a figure by its code chunk label with the **fig:** prefix, e.g., see Figure 7.1. Similarly, you can reference tables generated from **knitr::kable()**, e.g., see Table 7.1.

```
> knitr::kable(  
+   head(iris, 20), caption = 'Here is a nice table!',  
+   booktabs = TRUE  
+ )
```

You can write citations, too. For example, we are using the **bookdown** package (Xie, 2018) in this sample book, which was built on top of R Markdown and **knitr** (Xie, 2015).

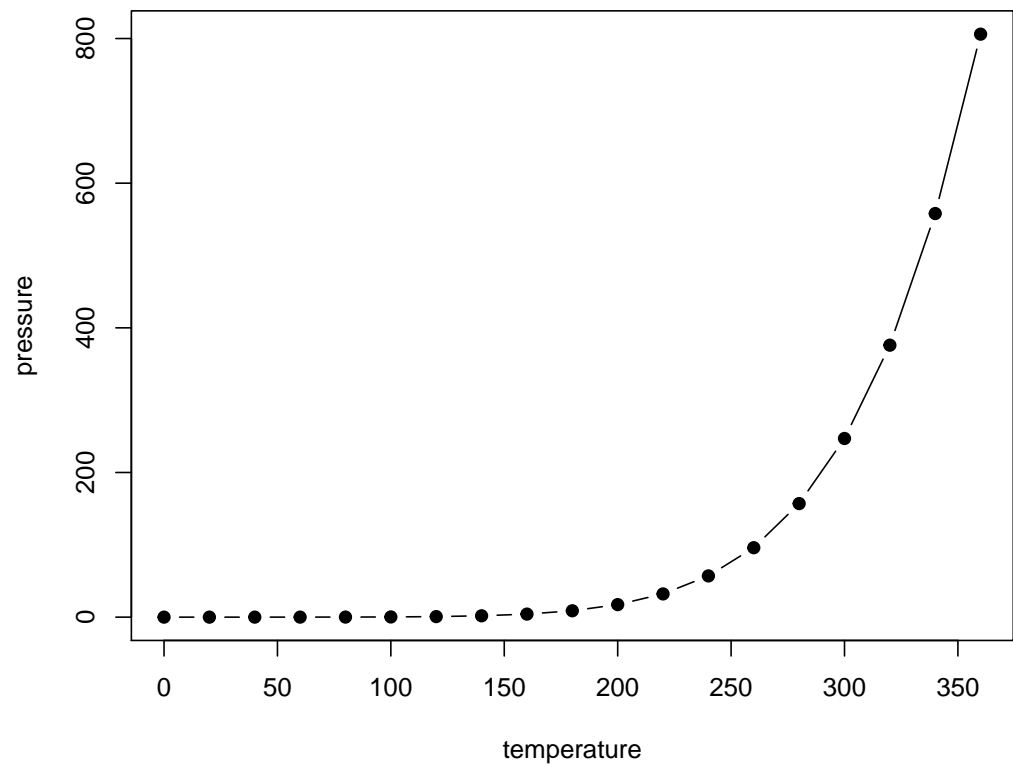


Figure 7.1: Here is a nice figure!

Table 7.1: Here is a nice table!

| Sepal.Length | Sepal.Width | Petal.Length | Petal.Width | Species |
|--------------|-------------|--------------|-------------|---------|
| 5.1          | 3.5         | 1.4          | 0.2         | setosa  |
| 4.9          | 3.0         | 1.4          | 0.2         | setosa  |
| 4.7          | 3.2         | 1.3          | 0.2         | setosa  |
| 4.6          | 3.1         | 1.5          | 0.2         | setosa  |
| 5.0          | 3.6         | 1.4          | 0.2         | setosa  |
| 5.4          | 3.9         | 1.7          | 0.4         | setosa  |
| 4.6          | 3.4         | 1.4          | 0.3         | setosa  |
| 5.0          | 3.4         | 1.5          | 0.2         | setosa  |
| 4.4          | 2.9         | 1.4          | 0.2         | setosa  |
| 4.9          | 3.1         | 1.5          | 0.1         | setosa  |
| 5.4          | 3.7         | 1.5          | 0.2         | setosa  |
| 4.8          | 3.4         | 1.6          | 0.2         | setosa  |
| 4.8          | 3.0         | 1.4          | 0.1         | setosa  |
| 4.3          | 3.0         | 1.1          | 0.1         | setosa  |
| 5.8          | 4.0         | 1.2          | 0.2         | setosa  |
| 5.7          | 4.4         | 1.5          | 0.4         | setosa  |
| 5.4          | 3.9         | 1.3          | 0.4         | setosa  |
| 5.1          | 3.5         | 1.4          | 0.3         | setosa  |
| 5.7          | 3.8         | 1.7          | 0.3         | setosa  |
| 5.1          | 3.8         | 1.5          | 0.3         | setosa  |

## 7.2 My own (miscellaneous) tests

### 7.2.1 Install stackr with vignettes

Building vignettes takes some time. So if you are in a hurry, than just install stackr. You can still look at the vignettes in R help. The difference is: With `build_vignettes = TRUE` and then `browseVignettes("stackr")` you can look at the vignettes in your default browser. This is slightly more comfortable.

```
> devtools::install_github("dgrtwo/stackr", build_vignettes = TRUE)
> browseVignettes("stackr")
```

## 7.3 Load several packages at once

The following code is part of a debate at SO with different suggestions. It seems to me, that all suggestions (utility packages, code examples) has some disadvantages:

- **lapply:** For me the best approach – it uses just `lapply`. I have changed `require` to `library` because of the arguments by Yihui. My lines now gives a error message and stops if one of the called packages is not installed.
- **easypackages:** is not available on CRAN anymore, has very poor downloads.
- **pacman:** a very sophisticated programm, but – for me at least – to complex and therefore to much overhead.
- **installed.packages:** ipak.R This loads *and* installs missing packages. It is quite similar as `lapply`-version, but – because of the if-condition – more complex. Additionally it is checking which packages are installed:

“This can be slow when thousands of packages are installed, so do not use this to find out if a named package is installed (use `system.file` or `find.package`) nor to find out if a package is usable (call `require` and check the return value) ...”

So maybe the best would be to combine the `lapply` with the `installed.packages` version. But insted to use `installled.packages` I should use in the if-statement `require`, check for the return value and – if necessary – to install missing packages.

```
> x <- c("plyr", "psych", "tm")
> lapply(x, library, character.only = TRUE)
```

### 7.3.1 How many downloads of a defined packages?

```
> library(dlstats)
> y <- cran_stats("learnr")
> ggplot(y, aes(start, downloads, group = package, color = package)) +
+   geom_line() + geom_point(aes(shape = package))
> # cranApp()
```

## 7.4 Some data to remind

1. How to find answers tagged with `r` and not active since 6 month: Search
3. What kind of actions are are allowed with `combine_url1`?

I have added timeline to the list!

### 7.4.1 Some experiments

```
> library(tidyverse)
> library(lubridate)
> library(jsonlite)
>
> # returns: "Error in open.connection(con, "rb") : HTTP error 400."
>
> json_file1 <- "https://api.stackexchange.com/2.2/events?site=stackoverflow&key=mRTYimh499J3lInIGjcxfa"
> json_list1 <- jsonlite::fromJSON(json_file1, flatten = TRUE)
> df1 <- as.tibble(json_list1[[1]])
> df1 <- df1 %>% mutate(created = with_tz(as.POSIXct(creation_date, origin = "1970-01-01"), "UTC"))

> library(dplyr)
> mtcars[1:10, 1:2] %>%
+   mutate(
+     car = row.names(.),
+     # You don't need format = "latex" if you have ever defined options(knitr.table.format)
+     mpg = cell_spec(mpg, "latex", color = ifelse(mpg > 20, "red", "blue")),
+     cyl = cell_spec(cyl, "latex", color = "white", align = "c", angle = 45,
+       background = factor(cyl, c(4, 6, 8), c("#666666", "#999999", "#BBBBBB")))
+ ) %>%
+ select(car, mpg, cyl) %>%
+ kable("latex", escape = F, booktabs = T, linesep = "")
```

| car               | mpg  | cyl |
|-------------------|------|-----|
| Mazda RX4         | 21   | 6   |
| Mazda RX4 Wag     | 21   | 6   |
| Datsun 710        | 22.8 | 4   |
| Hornet 4 Drive    | 21.4 | 6   |
| Hornet Sportabout | 18.7 | 8   |
| Valiant           | 18.1 | 6   |
| Duster 360        | 14.3 | 8   |
| Merc 240D         | 24.4 | 4   |
| Merc 230          | 22.8 | 4   |
| Merc 280          | 19.2 | 6   |



# Bibliography

Xie, Y. (2015). *Dynamic Documents with R and knitr*. Chapman and Hall/CRC, Boca Raton, Florida, 2nd edition. ISBN 978-1498716963.

Xie, Y. (2018). *bookdown: Authoring Books and Technical Documents with R Markdown*. R package version 0.7.