Regular Expressions

Bugsquashing Seminar
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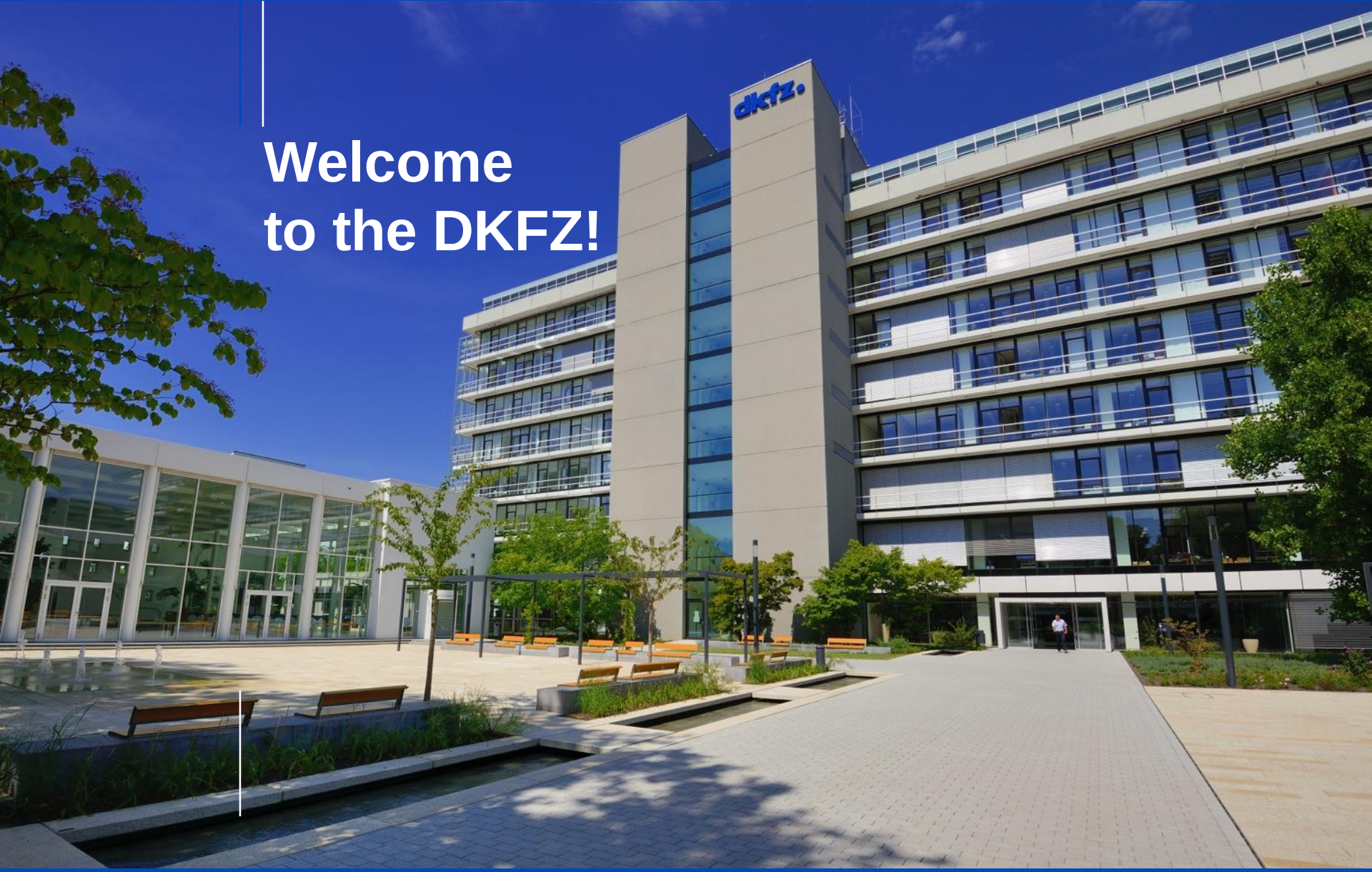

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IN THE HELMHOLTZ ASSOCIATION

50 Years – Research for
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Regular Expressions (RegExp, Regex)

Used to define string patterns for pattern matching

1. Find occurrences of pattern in string (and replace, split, …)
2. Check whether string matches pattern

Sidenote:
Regular Expressions form regular languages.
RegExp/Regex more expressive, but not regular.

C++ Implementations

1. `std::regex`
   C++11, GNU ≥ 4.9

2. `boost::regex`
   Additional dependency

3. `QRegExp/QRegularExpression`
   QRegularExpression since Qt 5.0

Usually compiled at runtime

How to define patterns

Define patterns using strings:

"^(Hi|Hello|Dear)\s\w+,"

Literals:

"Hello" → *"Hello"*

Quantifiers:

"()?" → zero or one times

"()"* → any number of times

"()+" → one or more times

"(){n,m}" → between n and m times

"ab"* → *"a"*, *"ab"*, *"abb"*, *"abbb"*, …

Ranges and grouping

Specify range or set with brackets:

"[abc]" → *"a"*, *"b"*, *"c"*

"[a-zA-Z0-9]" → one alphanumeric character

"[-a-c]" → *"-"*, *"a"*, *"b"*, *"c"*

"[^abc]" → any character except *"a"*, *"b"* or *"c"*

Define subpatterns using parentheses:

"(ab)"* → *""*, *"ab"*, *"abab"*, …

"(Hi|Hello|Dear)" → *"Hi"*, *"Hello"*, *"Dear"*

Metacharacters (selection)

"^" → beginning of line (or string)
"$" → end of line (or string)
"\A", "\Z" → beginning, end of string

"\d" / "\D" → digit / non-digit character
"\w" / "\W" → word (alphanumeric) / non-word character

"\s" / "\S" → whitespace / non-whitespace character
"\t", "\n" → tab, newline character
".", "\." → any character, dot

Example: DICOM UIDs

Format

Any positive number of non-negative integers, separated by dots.

Maximum length of 64 characters including dots

(not always enforced)

Non-zero integers must not contain leading zeros

1.2.3.4.5

123.0.45

123.04.5

12.a.4.5,6

Example: DICOM UIDs

```
#include <QtGlobal>
#if QT_VERSION >= 0x050000
  #include <QRegularExpression>
#else
  #include <QRegExp>
#endif


bool QmitkDicomBulkRetrieveWidget::IsValidDicomUID(const QString& uid)
{
#if QT_VERSION >= 0x050000
  QRegularExpression uidPattern("\\A([1-9][0-9]*|0)(\\.([1-9][0-9]*|0))*\\z");
  return uidPattern.match(uid).hasMatch();
#else
  QRegExp uidPattern("([1-9][0-9]*|0)(\\.([1-9][0-9]*|0))*");
  return uidPattern.exactMatch(uid);
#endif
}
```

More advanced functionality

Independent subexpressions

Backreferences

Recursive patterns

Conditional matching

Look-ahead and look-behind assertions

…

Thank you for your attention!

Further information on www.dkfz.de

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