This project is about providing a combinatorial statistics analogue of Sloane’s On-Line Encyclopedia of Integer Sequences.
This project is about providing a combinatorial statistics analogue of Sloane’s On-Line Encyclopedia of Integer Sequences.

Example

Decompose the group algebra of the symmetric group into irreducibles:

\[ \mathbb{C}[S_1] = V_1 \]
\[ \mathbb{C}[S_2] = V_2 \oplus V_{11} \]
\[ \mathbb{C}[S_3] = V_3 \oplus 2V_{21} \oplus V_{111} \]
\[ \mathbb{C}[S_4] = V_4 \oplus 3V_{31} \oplus 2V_{22} \oplus 3V_{211} \oplus V_{1111} \]
This project is about providing a combinatorial statistics analogue of Sloane’s On-Line Encyclopedia of Integer Sequences.

Example

Decompose the group algebra of the symmetric group into irreducibles:

\[
\begin{align*}
\mathbb{C}[S_1] &= V_1 \\
\mathbb{C}[S_2] &= V_2 \oplus V_{11} \\
\mathbb{C}[S_3] &= V_3 \oplus 2V_{21} \oplus V_{111} \\
\mathbb{C}[S_4] &= V_4 \oplus 3V_{31} \oplus 2V_{22} \oplus 3V_{211} \oplus V_{1111}
\end{align*}
\]

Question

What do the coefficients count?
What is this project about?

What is a combinatorial statistic?

- We assume a combinatorial collection to be a set $S$, for which the elements admit a “combinatorial description”.
- A combinatorial statistic on a set $S$ is - in our context - a map

$$st : S \rightarrow \mathbb{Z}.$$
What is this project about?

What is a combinatorial statistic?

- We assume a combinatorial collection to be a set $S$, for which the elements admit a “combinatorial description”.
- A combinatorial statistic on a set $S$ is - in our context - a map

$$st : S \rightarrow \mathbb{Z}.$$ 

This project has two main aims:

- Providing a web interface to test if your data is a known combinatorial statistic in our database,
- Providing a platform to gather information about combinatorial collections and statistics, and about their relations. This includes:
  - adding new combinatorial statistics to the database,
  - filling the wiki with information.
What is this project about?

What is a combinatorial statistic?

- We assume a combinatorial collection to be a set $S$, for which the elements admit a “combinatorial description”.
- A combinatorial statistic on a set $S$ is - in our context - a map

$$st : S \rightarrow \mathbb{Z}.$$  

This project has two main aims:

- Providing a web interface to
  - test if your data is a known combinatorial statistics in our database, or
  - test if your data can be obtained from known combinatorial statistics in the database by applying combinatorial maps.
What is this project about?

What is a combinatorial statistic?

- We assume a combinatorial collection to be a set $S$, for which the elements admit a “combinatorial description”.
- A combinatorial statistic on a set $S$ is - in our context - a map

$$st : S \rightarrow \mathbb{Z}.$$  

This project has two main aims:

- Providing a web interface to
  - test if your data is a known combinatorial statistics in our database, or
  - test if your data can be obtained from known combinatorial statistics in the database by applying combinatorial maps.

- Providing a platform to gather information about combinatorial collections and statistics, and about their relations. This includes
  - adding new combinatorial statistics to the database, and
  - filling the wiki with information.
Another example on permutations

Example

\[
\begin{align*}
[1, 2, 3] &\mapsto 0 \\
[1, 3, 2] &\mapsto 2 \\
[2, 1, 3] &\mapsto 1 \\
[2, 3, 1] &\mapsto 2 \\
[3, 1, 2] &\mapsto 1 \\
[3, 2, 1] &\mapsto 3
\end{align*}
\]
Yet another example on Dyck paths

Example

- \(10101010 \mapsto 16\)
- \(10101100 \mapsto 5\)
- \(10110010 \mapsto 6\)
- \(10110100 \mapsto 3\)
- \(10111000 \mapsto 1\)
One could now ask two questions for statistics on compositions:

- Are the coefficients of $Q_{1,2,3}$, $Q_{2,3}$, $Q_{1,2}$, and $Q_2$ known?
- If all coefficients are $q$ powers: Are their exponents known?

If someone knows what these statistics count, then they can go into the database!
What we have

- A fairly stable running web interface
What we have

- A fairly stable running web interface
- Support for
  - permutations
  - Dyck paths
  - integer partitions and compositions
  - standard Young tableaux

About 25-30 entries in the database
dozens of combinatorial maps between these objects
What we have

- A fairly stable running web interface
- Support for
  - permutations
  - Dyck paths
  - integer partitions and compositions
  - standard Young tableaux
- About 25-30 entries in the database
What we have

- A fairly stable running web interface
- Support for
  - permutations
  - Dyck paths
  - integer partitions and compositions
  - standard Young tableaux
- About 25-30 entries in the database
- dozens of combinatorial maps between these objects
What we have

- A fairly stable running web interface
- Support for
  - permutations
  - Dyck paths
  - integer partitions and compositions
  - standard Young tableaux
- About 25-30 entries in the database
- dozens of combinatorial maps between these objects
- A more or less documented wiki for permutation and Dyck paths
What we would like (with your support)

To get the project running, we need to
- fill the database,
- fill the wiki,
- provide support for more combinatorial objects, and
- provide generating function and partial generating function functionality.

You (and your students!) are more than invited to help the project grow!
Thanks

This project is based on the following open software projects:
- MoinMoin Wiki,
- Sage,
- MathJax, and

is hosted by LaCIM, UQAM, Montreal, Canada, with the help of
- Jason Grout, Franco Saliola, and Jerome Tremblay.