

# React Partitions

**React Partitions** is an upcoming interactive web app where users can animate bijections of integer partitions with Ferrers diagrams. The web app will be primarily aimed at applied mathematicians, especially professors and students in the combinatorics and probability fields. However, it will still be engaging and fun for people who are not into math! 😊

## Background

This project started off as a 10-week senior math research project under the supervision of Prof. Stephen DeSalvo in the spring of 2014 at UCLA. The focus was to create an app which (1) generates random partitions of a given positive integer  $n$  such that they have asymptotically  $O(\sqrt{n} \log n)$  parts with high probability,<sup>1</sup> and (2) visualizes how certain bijections affect the overall limit shape of those partitions.<sup>2</sup> The app was originally supposed to be written in C++ using Qt, but it ultimately became a [Java applet](#) instead due to time constraints.

*React Partitions* is intended to replace that applet, since Java applets were removed from Java SE 11 in September 2018.

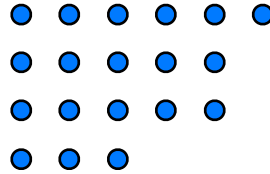
## Math Terms: What You Need to Know

- A **partition** of positive integer  $n$ , also called an **integer partition**, is a way of writing  $n$  as a sum of positive integer parts, which are conventionally in decreasing order. The notation  $\lambda \vdash n$  means that  $\lambda$  is a partition of  $n$ . For example,  $\lambda = (3, 2, 2, 2, 1) \vdash 10$ .

<sup>1</sup> Stephen DeSalvo. Improvements to exact Boltzmann sampling using probabilistic divide-and-conquer and the recursive method. arXiv preprint [arXiv:1608.07922v1](https://arxiv.org/abs/1608.07922v1) [math.CO], 2016.

<sup>2</sup> Igor Pak. The nature of partition bijections II. Asymptotic stability. Preprint (2004), 32 pp., available at <http://www.math.ucla.edu/~pak/>.

- A **Ferrers diagram** represents an integer partition as patterns of dots, with the  $k^{\text{th}}$  row having the same number of dots as the  $k^{\text{th}}$  part in the partition.



**FIGURE 1.** The Ferrers diagram of partition  $\lambda = (6, 5, 5, 3)$ .

- A **bijection** is a function which is one-to-one and onto.
  - A function  $f$  with domain  $X$  is **one-to-one** if for all  $a$  and  $b$  in  $X$ , whenever  $a \neq b$ , then  $f(a) \neq f(b)$ .
  - A function  $f$  with domain  $X$  and codomain  $Y$  is **onto** if for all  $y$  in  $Y$ , there is at least one  $x$  in  $X$  such that  $f(x) = y$ .

## Building and Running Locally

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```
git clone https://github.com/kristorres/react-partitions
cd react-partitions
npm install
npm run build-dev
```

Now go to *build/dev/index.html* on your favorite browser to view the web app. 😎