

Topological methods in combinatorics

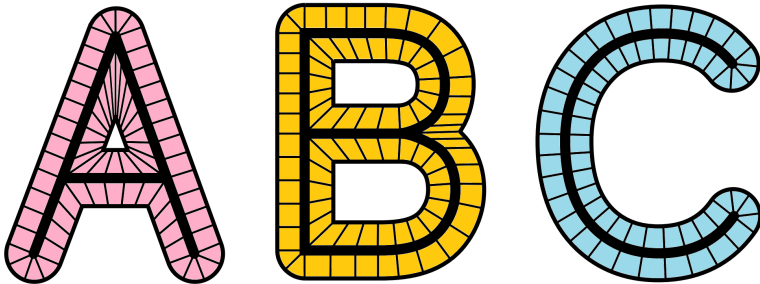
Martin Balko

2nd lecture

March 4th 2022



Homotopy

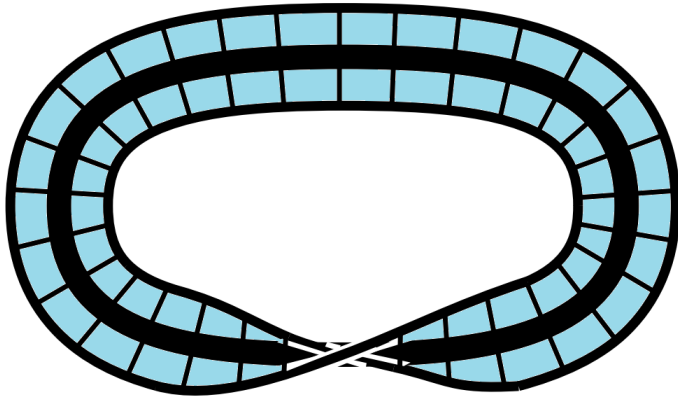


Source: Hatcher: Algebraic topology (colored)

Homotopy: example

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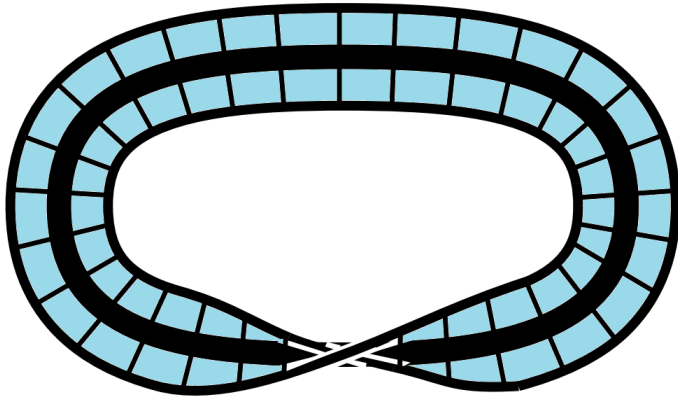
- The Möbius band is **homotopy equivalent** to a circle.



Source: Hatcher: Algebraic topology (colored)

Homotopy: example

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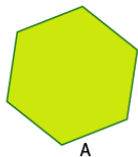
Source: Hatcher: Algebraic topology (colored)

- However, they are **not homeomorphic**.

Contractible spaces: examples

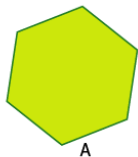
Contractible spaces: examples

- Which of the following spaces are **contractible**?



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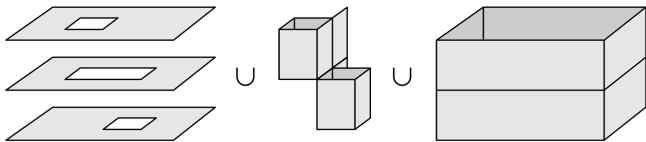
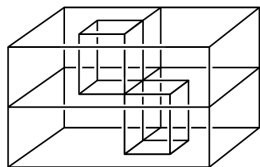


Source: <https://en.wikipedia.org>

- A, B, C** are, while **D, E, F** are not.

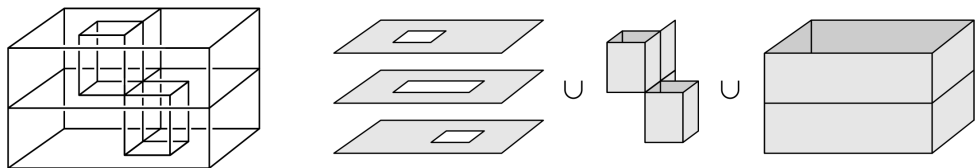
Contractible spaces: weird example

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Source: Hatcher: Algebraic topology

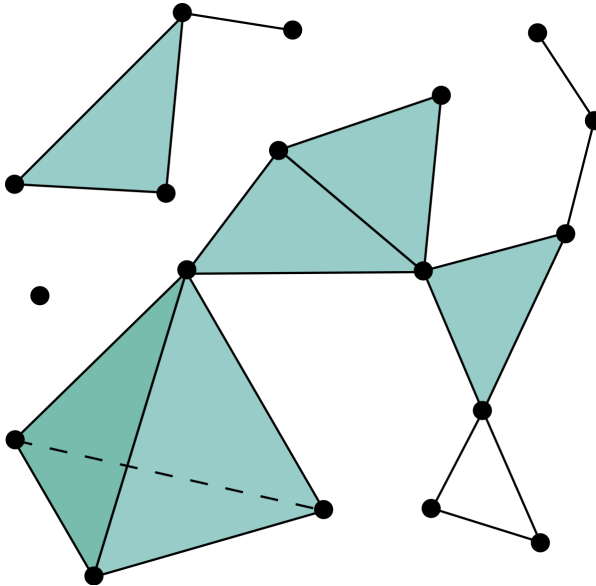
Contractible spaces: weird example



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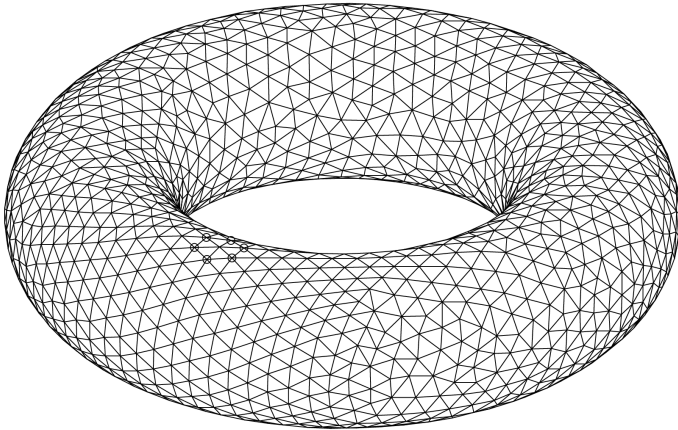
- **Bing's house** is a contractible space (not so easy to see, right?).

Simplicial complexes



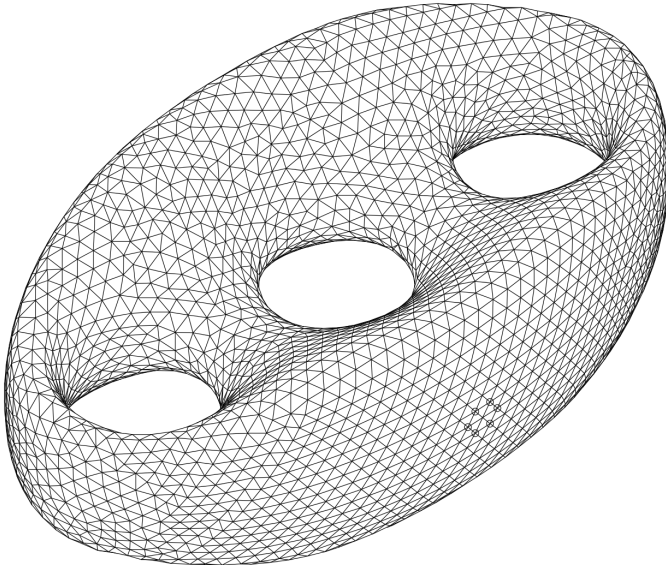
Triangulation: examples

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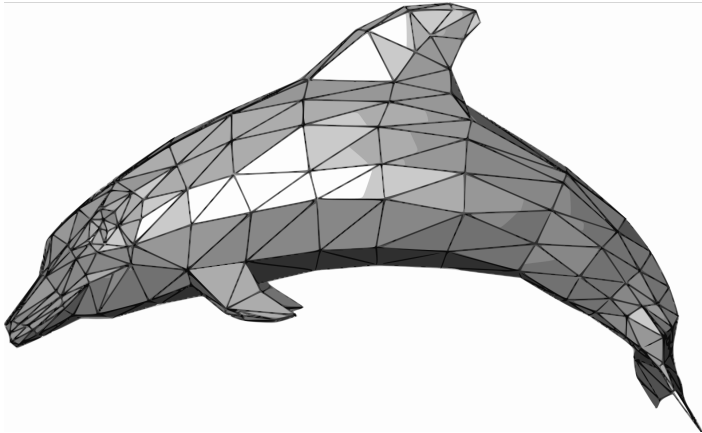
Source: <https://en.wikipedia.org/>

Triangulation: examples



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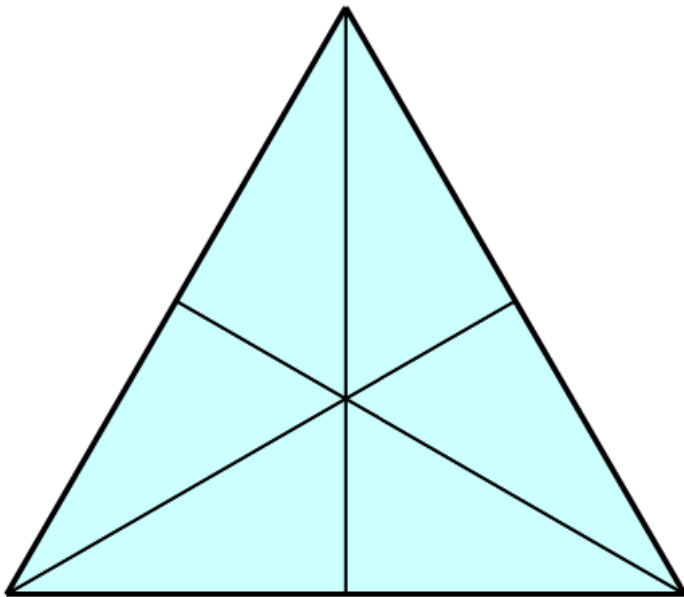
Triangulation: examples



Source: <https://en.wikipedia.org/>

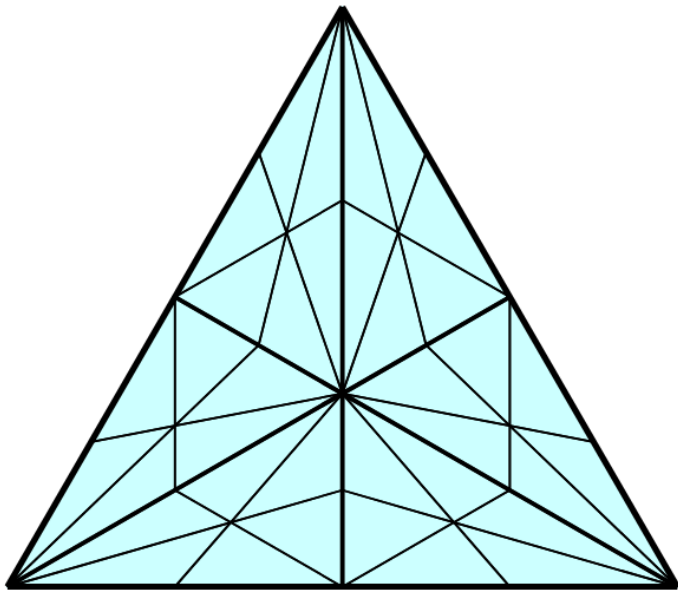
Barycentric subdivision: example

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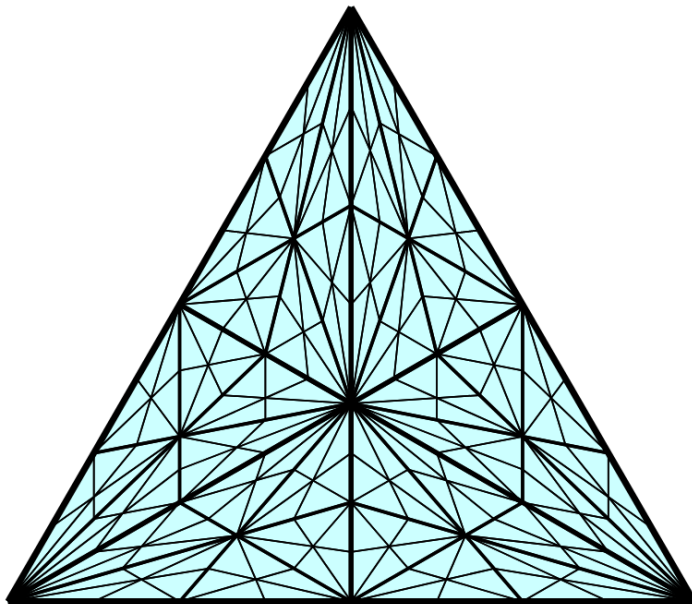
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Barycentric subdivision: example



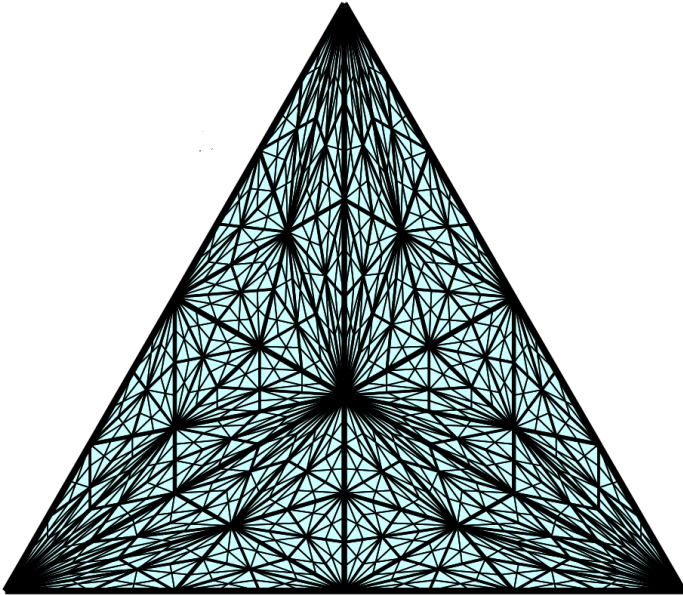
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Thank you for your attention.