Quotients of LPMs on [3]
A summary

\[ \begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 2 & 1 \end{bmatrix} \]

Linear Independence / Bases

\[ B = \{ 1, 2, 3, 4 \} \]

Graphs

\[ G: \]

\[ M = ( [n], B ) \text{ matroid iff} \]

1. \( B \neq \emptyset \)
2. \( \forall A, B \subseteq B: \exists a \in A \setminus B \exists b \in B \setminus A \text{ s.t. } A \setminus \{ a \} \cup \{ b \} \in B \]

\[ M_G = ( [5], B ) \text{ with} \]

\[ B = \{ 1, 2, 3, 4, 5 \} \]
Other examples: greedy algorithm; algebraic extensions; projective geometry; polytopes; etc.
Another summary

Algebra

\[
\begin{bmatrix}
1 & 1 & 2 \\
0 & 0 & 1 \\
0 & 1 & 1 \\
1 & 1 & 2 \\
\end{bmatrix}
\]

Matroids

Axiomatization

\[\text{"M is a quotient of N" \iff \forall C \in \mathcal{E}(N) :} \]
\[C = \bigcup C_i \text{ with } C_i \in \mathcal{E}(M)\]
Another summary

Algebra

\[
\begin{bmatrix}
1 & 1 & 2 \\
0 & 0 & 1 \\
0 & 1 & 1 \\
1 & 1 & 2
\end{bmatrix}
\]

Matroids

Axiomatization

"\(M\) is a quotient of \(N\)"

iff

\(\forall C \in \mathcal{C}(N) : \)

\(C = \bigcup C_i \) with

\(C_i \in \mathcal{C}(M)\)

¿How does this property look in other families?
An example on [17]
Quotients of LPMs on [3]
Finally...

Matroids are connected with many branches of mathematics, both pure and applied.

- Are there other axiomatizations?
- How do we understand those axiomatizations on graphs?

¡Muchas gracias!
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- What does a matroid polytope say in optimization?
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¡Muchas gracias!