



ART+SCIENCE = MUSIC TECHNOLOGY

A love story

- ♪ Midi 1
- ♪ Midi 2
- ♪ Midi 3
- ♪ Midi 4
- ♪ Midi 5
- ♪ Midi 6
- ♪ Midi 7



MUSIC TECHNOLOGY

What does MUSIC TECHNOLOGY mean?

- Music technology is also known as MIR

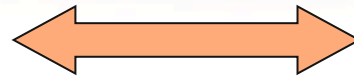
MIR = **M**usic **I**nformation **R**etrieval

- MIR started as an indexing problem in musical libraries.

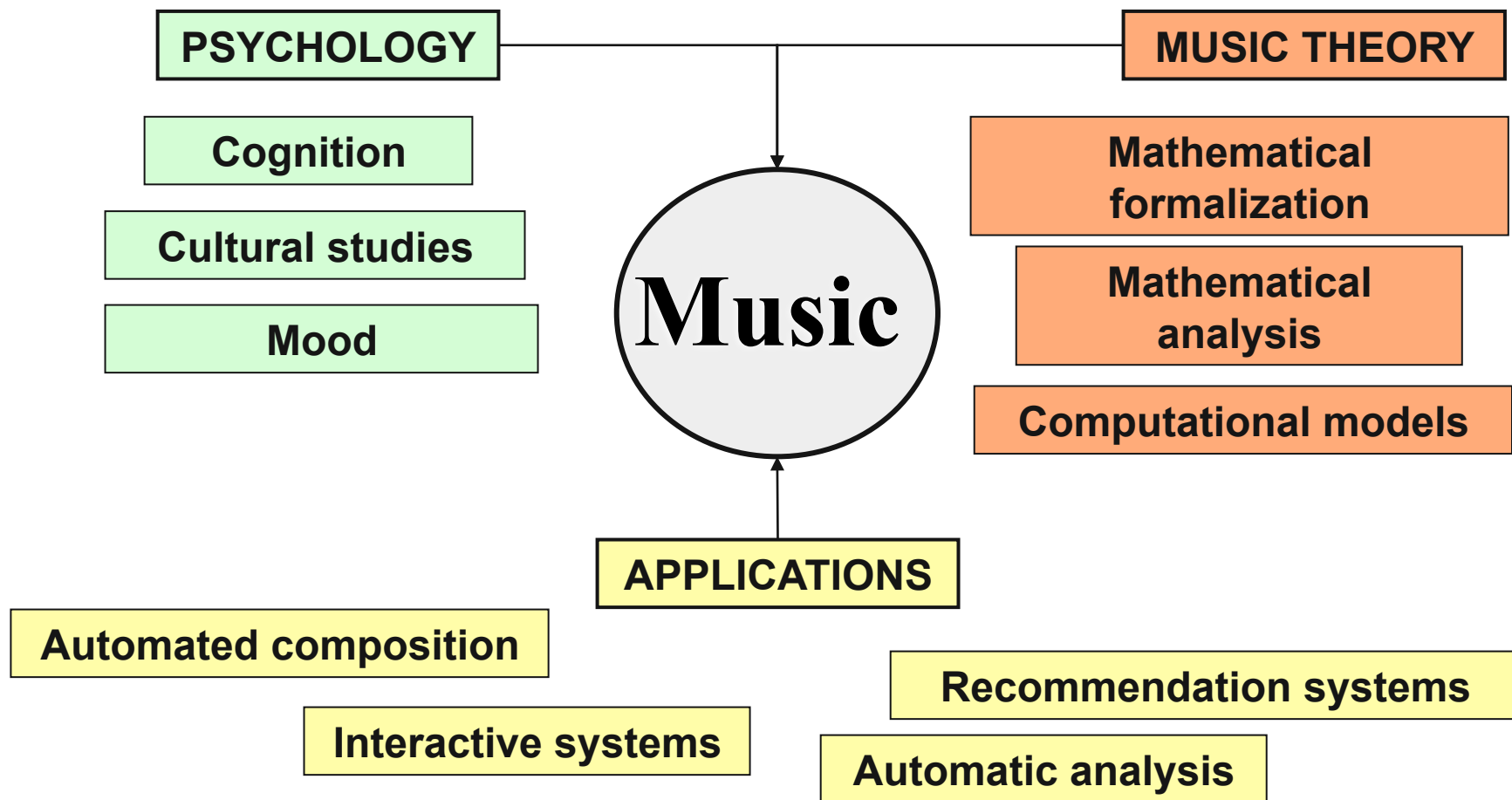
So, what is MUSIC TECHNOLOGY
nowadays?

MUSIC TECHNOLOGY

Music



**Science/
Technology**





MUSIC TECHNOLOGY

MUSIC TECHNOLOGY is the following.

- Computational methods for:
 - **Classification, clustering, and modelling**
 - **Musical feature extraction for mono- and polyphonic music**
 - **Similarity and pattern matching**
 - **Efficient retrieval of music**



MUSIC TECHNOLOGY

MUSIC TECHNOLOGY is the following.

- Formal methods and databases:
 - **Applications of automated and music identification and recognition.**
 - **Score following, automatic accompaniment, routing.**
 - **Filtering for music and music queries.**
 - **Query languages, standards and other metadata or protocols for music information handling and retrieval.**
 - **Distributed search.**



MUSIC TECHNOLOGY

MUSIC TECHNOLOGY is the following.

- **Software for music information retrieval:**
 - **Semantic web.**
 - **Musical digital objects.**
 - **Intelligent agents, collaborative software, web-based search**
 - **Semantic retrieval, query by humming, semantic retrieval.**



MUSIC TECHNOLOGY

MUSIC TECHNOLOGY is the following.

- **Human-computer interaction and interfaces.**
 - **Multi-modal interfaces.**
 - **User interfaces.**
 - **Usability.**
 - **Mobile applications.**
 - **User behavior.**



MUSIC TECHNOLOGY

MUSIC TECHNOLOGY is the following.

- Music cognition:
 - Music perception,
 - Cognition, affect, and emotions.
 - Music similarity metrics.
 - Syntactical parameters and semantic parameters.
 - Musical forms and structures
 - Styles and genres.
 - Music annotation methodologies.



MUSIC TECHNOLOGY

MUSIC TECHNOLOGY is the following.

- Music analysis and knowledge representation:
 - **Automatic summarization, citing, excerpting, downgrading, and transformation**
 - **Formal models of music.**
 - **Digital scores and representation.**
 - **Music indexing and metadata.**



MUSIC TECHNOLOGY

MUSIC TECHNOLOGY is the following.

- Music archives:
 - Libraries, and digital collections
 - Public access to musical archives.
 - Benchmarks and research databases.
- Intellectual property rights:
 - National and international copyright issues.
 - Digital rights management.
 - Identification and traceability.



MUSIC TECHNOLOGY

MUSIC TECHNOLOGY is the following.

- Sociology and Economy of music:
 - **Music industry.**
 - **Use of MIR in the production, distribution, consumption chain.**
 - **User profiling, validation, user needs and expectations.**
 - **Evaluation of music IR systems.**
 - **Building test collections.**
 - **Experimental design and metrics.**



MUSIC TECHNOLOGY AT E.U.I.

MY RESEARCH INTERESTS:

- Measures of similarity, including rhythmic similarity and melodic similarity.
- Phylogenetic analysis of music.
- Mathematical measures of rhythm complexity and syncopation.
- Musical transformations applied to rhythm and melody.



MUSIC TECHNOLOGY AT E.U.I.

MY RESEARCH INTERESTS:

- Automatic analysis of music traditions, specially flamenco music, Afro-Cuban music, Brazilian music and in general African music.
- Mathematical and computational modelling of musical grouping.
- Mathematical and computational modelling of musical tension.



MUSIC TECHNOLOGY AT E.U.I.

MY RESEARCH INTERESTS:

- Tuning systems.
- Teaching mathematics via the arts.
- Visualization of music.



MUSIC TECHNOLOGY AT E.U.I.

SOME RECENT PAPERS:

- Mora, J., **Gómez**, F., Gómez, E., Escobar Borrego, F., Díaz Báñez, J. M. Characterization and Melodic Similarity of A Cappella Flamenco Cantes. In Proceedings of ISMIR (International Symposium on Music Information Retrieval). Utrecht School of Music, Utrecht, Netherland, August 9-13, 2010.
- Gerofsky, S., **Gómez**, F. , Rappaport, D., and Toussaint, G. Spirograph patterns and circular representations of rhythm: Exploring number theory concepts through visual, tangible and audible representations. In Proceedings of BRIDGES: Mathematical Connections in Art, Music, and Science, Banff, Alberta, Canada, 2009.
- Ballinger, B., Benbernou, N, **Gómez**, F., O'Rourke, J. and Toussaint, G. T. The continuous hexachordal theorem. In Proceedings of Mathematics and Computation in Music, pages 11-21. Yale University.
- **Gómez**, F., Talaskian, P. and Toussaint, G.T. Interlocking and Euclidean Rhythms. *Journal of Mathematics and Music*, Volume 3, Issue 1, 2009.



MUSIC TECHNOLOGY AT E.U.I.

SOME RECENT PAPERS:

- **Gómez**, F., Talaskian, P. and Toussaint, G.T. Structural Properties of Euclidean Rhythms. *Journal of Mathematics and Music*, Volume 3, Issue 1, 2009.
- Guastavino, C., **Gómez**, F., Toussaint, G., Marandola, F., Gómez, E. (2009). Measuring Similarity between Flamenco Rhythmic Patterns. *Journal of New Music Research*. 38(2).
- Demaine, E., **Gómez**, F., Meijer, H., Rappaport, D., Taslakian, P., Toussaint, G. T., Winograd, T. and Wood, D. R. The Distance Geometry of Music. *Computational Geometry: Theory and Application*, 42, 429-454, 2009.
- Colannino, J., **Gómez**, F., and Toussaint, G.T. Analysis of Emergent Beat-Class Sets in Steve Reich's Clapping Music and the Yoruba Bell Timeline. *Perspectives of New Music*, vol. 47, no.1, 111-134, 2009.
- Díaz Báñez, F. **Gómez**, J. M., G. Farigu, F. Gómez, D. Rappaport, G. T. Toussaint. Similaridad y evolución en la rítmica del flamenco: una incursión de la matemática computacional. *La Gaceta de la Real Sociedad Matemática Española*, vol 8.2, 489-509, 2005.



THE COFLA PROJECT

THE COFLA PROJECT:

- A group of researchers from different discipline.
- Mathematicians, computer scientists, flamenco experts, music theory experts.
- Scientific study of flamenco music.

MUSIC TECHNOLOGY AT E.U.I.

Debla: "En el barrio de Triana"

Antonio Mairena



Modo frigio-andaluz

Trans.: J.M.R.



Muy calante

MUSIC TECHNOLOGY AT E.U.I.



Debla: "En el barrio de Triana" Chano Lobato

Modo frigio-andaluz

Trans.: J.M.R



The background of the slide is a warm-toned, artistic illustration. On the left, the body and f-hole of a violin are visible in shades of brown and gold. To the right, there are faint, stylized musical notes and staff lines in a similar color palette. The overall texture is painterly and ethereal.

THE CORPUS

- WE GATHERED A CORPUS OF 365 PIECES
- THEY BELONG TO THE *TONÁS* STYLE.
- WE CHOSE TWO PARTICULAR STYLES:
DEBLAS AND *MARTINETES*:
 1. BOTH STYLES ARE IMPORTANT.
 2. RECORDINGS WERE ACCEPTABLE.
 3. 72 *CANTES* IN TOTAL: 16 *DEBLAS* AND 56 *MARTINETES*.
 4. ENOUGH VARIABILITY IN THE SAMPLE.



MUSICAL FEATURES: DEBLAS

- **BEGINING BY THE WORD “¡AY!”.**
- **LINK OF “¡AY!” TO THE TEXT.**
- **INITIAL NOTE: usually fifth or sixth degree.**
- **DIRECTION OF MELODIC MOVEMENT.**
- **REPETITION OF THE FIRST HEMISTICH.**



MUSICAL FEATURES: DEBLAS

- **CAESURA.**
- **DIRECTION OF MELODIC MOVEMENT IN THE SECOND HEMISTICH.**
- **HIGHEST DEGREE IN THE SECOND HEMISTICH.**
- **FREQUENCY OF THE HIGHEST DEGREE.**
- **DURATION.**



MUSICAL FEATURES: MARTINETE 1

- **REPETITION OF FIRST HEMISTICH.**
- **PRESENCE OF CLIVIS/FLEXA AT THE END OF THE HEMISTICH.**
- **HIGHEST DEGREE IN BOTH HEMISTICHS.**
- **FREQUENCY OF THE HIGHEST DEGREE.**
- **FINAL NOTE OF THE SECOND HEMISTICH.**
- **DURATION.**



MUSICAL FEATURES: MARTINETE 2

- **HIGHEST DEGREE IN BOTH HEMISTICHS.**
- **FREQUENCY OF THE HIGHEST DEGREE IN BOTH HEMISTICHS.**
- **SYMMETRY OF THE HIGHEST DEGREE.**
- **DURATION.**



COMMON MUSICAL FEATURES

- **TYPE OF SCALE.**
- **DIRECTION OF THE MELODIC MOVEMENT IN THE FIRST HEMISTICH.**
- **SYMMETRY OF THE HIGHEST DEGREE.**
- **PRESENCE OF CLIVIS.**
- **REPETITION OF THE FIRST HEMISTICH.**
- **INITIAL NOTE.**
- **FINAL NOTE IN THE SECOND HEMISTICH.**
- **HIGHEST DEGREE IN BOTH HEMISTICHS.**
- **FREQUENCY OF THE HIGHEST DEGREE IN THE SECOND HEMISTICH.**
- **DURATION WITH RESPECT TO THE PIECE.**
- **DURATION WITH RESPECT TO THE WHOLE CORPUS.**



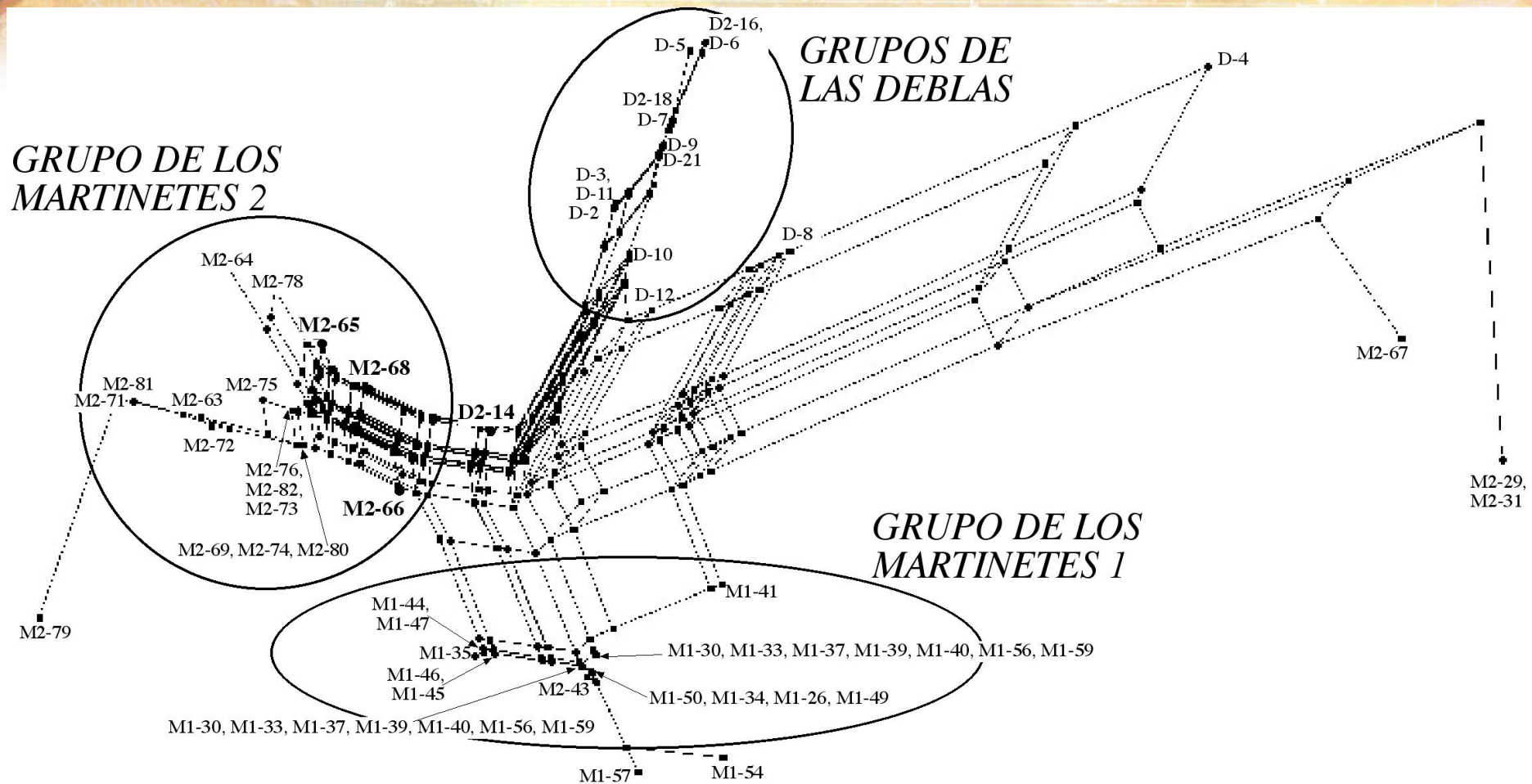
MELODIC SIMILARITY

- COMPUTATION OF THE VECTOR FEATURE.
- EUCLIDEAN DISTANCE.
- DISTANCE MATRIX.
- PHYLOGENETIC TREES.
- PERFORMANCE MEASURES.

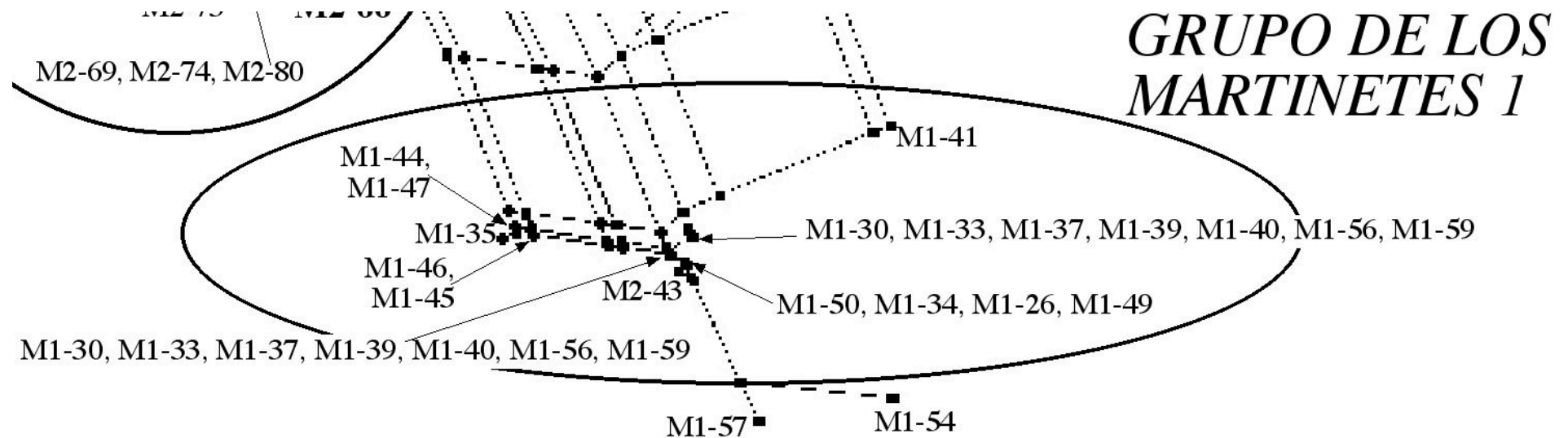
	A	B	C	D	E	F	G	H	I	J	K	L	M	
1	Clave	Muestra	Repetidos	Modo	Melo	Asimetria_2H	Subidas_2H	Flexa	Rep_Exp	Ataque	Calda	Agudo	Duracion	Re
2	M1-24	M-Mairena	1 T		1234	I		2 S	N	-4	2	4	11	
3	M1-25	M-Chano	1 T		1234	I		3 N	N	-4	2	5	15	
4	M1-26	M-Chocolate	1 T		1234	I		2 S	N	-4	2	4	8	
5	M1-27	M-Almadén	1 T		1234	I		2 N	N	-4	2	5	16	
6	M1-28	M-Heredia	1 T		1234	I		4 N	N	-4	2	4	20	
7	M1-29	M-Simón	1 T		1234	I		8 N	N	-4	2	5	30	
8	M1-30	M-Vargas	1 T		1234	I		3 S	N	-4	2	4	14	
9	M1-31	M-Naranja	1 T		1234	I		6 N	N	-4	2	5	26	
10	M1-32	M-PLucia	1 T		1234	I		4 N	N	-4	2	4	15	
11	M1-33	M-Talegón	1 T		1234	I		2 S	N	-4	2	4	16	
12	M1-34	M-Tomás	1 T		1234	I		3 N	N	-2	2	4	11	
13	M1-35	M-Turronero	1 T		1234	C		2 N	N	-4	2	4	10	
14	M1-36	M1_A Mairena - 2	1 T		1234	I		3 N	N	-4	2	4	19	
15	M1-37	M1_Antonio Agujetas	1 T		1234	I		2 S	N	-4	2	4	13	
16	M1-38	M1_A Mairena.- 3	1 T		1234	I		2 S	N	-4	2	4	15	
17	M1-39	M1_Chaqueta	1 T		1234	I		2 N	N	-4	2	4	13	
18	M1-40	M1_Curro Mairena	1 T		1234	I		4 N	N	-4	2	4	16	
19	M1-41	M1_Diego Clavel	1 T		1234	I		3 S	S	-4	2	4	22	
20	M1-42	M1_Diego Rubichi	1 T		1234	I		2 N	N	-4	2	4	18	
21	M1-43	M1_El Chocolate	1 T		1234	I		3 S	N	-4	2	4	11	
22	M1-44	M1_El Indio gitano	1 T		1234	C		3 N	N	-4	2	4	17	
23	M1-45	M1_El Negro del Puerto	1 T		1234	C		4 N	N	-4	2	4	19	
24	M1-46	M1_Enrique Morente	1 T		1234	C		3 N	N	-4	2	4	17	
25	M1-47	M1_Jose Mendez	1 T		1234	D		2 S	N	-4	1	4	13	
26	M1-48	M1_Juan Talega - 1	1 T		1234	I		3 N	N	1	2	4	12	
27	M1-49	M1_Juan Talega - 2	1 T		1234	I		2 N	N	-8	2	4	10	
28	M1-50	M1_Juan Talega - 3	1 T		1234	I		2 N	N	-8	2	4	11	
29	M1-51	M1_Juan Talega - 4	1 T		1234	I		3 N	N	-4	2	4	14	
30	M1-52	M1_Manuel de Angustias	1 T		1234	I		4 N	N	-4	2	5	15	
31	M1-53	M1_Miguel Vargas	1 T		1234	I		3 S	N	-4	2	4	15	
32	M1-54	M1_Mijita hijo	1 T		1234	D		1 S	N	-4	2	4	10	
33	M1-55	M1_Naranjito - 2 - REPE	0 T		1234	I		6 N	N	-4	2	5	27	
34	M1-56	M1_Niño Gloria.	1 T		1234	I		3 N	S	-2	2	4	18	
35	M1-57	M1_Paco el Lobo	1 T		1234	I		1 N	N	-4	2	4	13	
36	M1-58	M1_Pansequito	1 T		1234	I		3 S	N	-4	2	4	14	
37	M1-59	M1_Pedro Sanz	1 T		1234	I		3 S	N	-4	2	4	16	
38	M1-60	M1_Talegon - REPE	0 T		1234	I		2 S	N	-4	2	4	16	
39	M1-61	M1_Tio Mollino	1 T		1234	I		4 N	N	-4	2	4	13	
40	M1-62	M1_Turronero - REPE	0 T		1234	C		2 N	N	-4	2	4	11	
41	M2-63	M2_A Mairena	1 M		6787	D		5 N	N	3	3	6	17	
42	M2-64	M2_Barullo	1 M		6787	C		1 N	N	1	3	3	7	
43	M2-65	M2_Chocolate	1 M		6787	C		1 N	N	3	3	6	14	
44	M2-66	M2_D Agujetas	1 M		6787	I		3 N	N	1	3	6	11	
45	M2-67	M2_E Morente	1 M		6787	D		8 N	N	1	3	6	24	
46	M2-68	M2_El Chaqueta	1 M		6787	D		2 N	N	4	3	6	9	
47	M2-69	M2_El Torta	1 M		6787	D		4 N	N	1	3	6	12	
48	M2-70	M2_El Zambo	1 M		6787	D		2 N	N	1	3	6	10	
49	M2-71	M2_Enrique Soto Sordera	1 M		6787	D		5 N	N	1	3	6	14	
50	M2-72	M2_M Agujetas	1 M		6787	D		4 N	N	1	3	5	21	
51	M2-73	M2_M Mairena	1 M		6787	D		4 N	N	1	3	6	13	
52	M2-74	M2_M Poveda	1 M		6787	D		4 N	N	1	3	6	18	
53	M2-75	M2_Manolillo al Herra	1 M		6787	D		2 N	N	1	3	6	11	

Caso	1:M1-24	2:M1-25	3:M1-26	4:M1-27	5:M1-28	6:M1-29	7:M1-30	8:M1-31	9:M1-32	10:M1-33	11:M1-34	12:M1-35	13:M1-36
1:M1-24	0,000	0,147	0,031	0,147	0,096	19,325	0,096	19,325	0,096	0,096	0,000	0,843	0,096
2:M1-25	0,147	0,000	0,225	0,000	0,014	17,622	0,014	17,622	0,014	0,014	0,147	1,523	0,014
3:M1-26	0,031	0,225	0,000	0,225	0,181	20,865	0,181	20,865	0,181	0,181	0,031	0,853	0,181
4:M1-27	0,147	0,000	0,225	0,000	0,014	17,622	0,014	17,622	0,014	0,014	0,147	1,523	0,014
5:M1-28	0,096	0,014	0,181	0,014	0,000	17,582	0,000	17,582	0,000	0,000	0,096	1,409	0,000
6:M1-29	19,325	17,622	20,865	17,622	17,582	0,000	17,582	0,000	17,582	17,582	19,325	22,326	17,582
7:M1-30	0,096	0,014	0,181	0,014	0,000	17,582	0,000	17,582	0,000	0,000	0,096	1,409	0,000
8:M1-31	19,325	17,622	20,865	17,622	17,582	0,000	17,582	0,000	17,582	17,582	19,325	22,326	17,582
9:M1-32	0,096	0,014	0,181	0,014	0,000	17,582	0,000	17,582	0,000	0,000	0,096	1,409	0,000
10:M1-33	0,096	0,014	0,181	0,014	0,000	17,582	0,000	17,582	0,000	0,000	0,096	1,409	0,000
11:M1-34	0,000	0,147	0,031	0,147	0,096	19,325	0,096	19,325	0,096	0,096	0,000	0,843	0,096
12:M1-35	0,843	1,523	0,853	1,523	1,409	22,326	1,409	22,326	1,409	1,409	0,843	0,000	1,409
13:M1-36	0,096	0,014	0,181	0,014	0,000	17,582	0,000	17,582	0,000	0,000	0,096	1,409	0,000
14:M1-37	0,096	0,014	0,181	0,014	0,000	17,582	0,000	17,582	0,000	0,000	0,096	1,409	0,000
15:M1-38	0,096	0,014	0,181	0,014	0,000	17,582	0,000	17,582	0,000	0,000	0,096	1,409	0,000
16:M1-39	0,096	0,014	0,181	0,014	0,000	17,582	0,000	17,582	0,000	0,000	0,096	1,409	0,000
17:M1-40	0,096	0,014	0,181	0,014	0,000	17,582	0,000	17,582	0,000	0,000	0,096	1,409	0,000
18:M1-41	1,956	1,547	2,471	1,547	1,490	8,992	1,490	8,992	1,490	1,490	1,956	3,414	1,490
19:M1-42	0,096	0,014	0,181	0,014	0,000	17,582	0,000	17,582	0,000	0,000	0,096	1,409	0,000
20:M1-43	0,000	0,147	0,031	0,147	0,096	19,325	0,096	19,325	0,096	0,096	0,000	0,843	0,096
21:M1-44	0,532	0,936	0,658	0,936	0,853	18,668	0,853	18,668	0,853	0,853	0,532	0,181	0,853
22:M1-45	0,532	0,936	0,658	0,936	0,853	18,668	0,853	18,668	0,853	0,853	0,532	0,181	0,853
23:M1-46	0,532	0,936	0,658	0,936	0,853	18,668	0,853	18,668	0,853	0,853	0,532	0,181	0,853
24:M1-47	0,532	0,936	0,658	0,936	0,853	18,668	0,853	18,668	0,853	0,853	0,532	0,181	0,853
25:M1-48	0,190	0,408	0,328	0,408	0,336	17,442	0,336	17,442	0,336	0,336	0,190	0,501	0,336
26:M1-49	0,031	0,225	0,000	0,225	0,181	20,865	0,181	20,865	0,181	0,181	0,031	0,853	0,181
27:M1-50	0,000	0,147	0,031	0,147	0,096	19,325	0,096	19,325	0,096	0,096	0,000	0,843	0,096
28:M1-51	0,096	0,014	0,181	0,014	0,000	17,582	0,000	17,582	0,000	0,000	0,096	1,409	0,000
29:M1-52	0,147	0,000	0,225	0,000	0,014	17,622	0,014	17,622	0,014	0,014	0,147	1,523	0,014
30:M1-53	0,096	0,014	0,181	0,014	0,000	17,582	0,000	17,582	0,000	0,000	0,096	1,409	0,000
31:M1-54	2,091	3,017	1,716	3,017	2,956	32,814	2,956	32,814	2,956	2,956	2,091	1,201	2,956
33:M1-56	0,096	0,014	0,181	0,014	0,000	17,582	0,000	17,582	0,000	0,000	0,096	1,409	0,000
34:M1-57	0,999	1,162	0,698	1,162	1,201	27,723	1,201	27,723	1,201	1,201	0,999	2,264	1,201
35:M1-58	0,096	0,014	0,181	0,014	0,000	17,582	0,000	17,582	0,000	0,000	0,096	1,409	0,000
36:M1-59	0,096	0,014	0,181	0,014	0,000	17,582	0,000	17,582	0,000	0,000	0,096	1,409	0,000
38:M1-61	0,096	0,014	0,181	0,014	0,000	17,582	0,000	17,582	0,000	0,000	0,096	1,409	0,000
40:M2-63	7,488	7,529	7,943	7,529	7,696	18,168	7,696	18,168	7,696	7,696	7,488	5,278	7,696
41:M2-64	6,498	7,386	6,177	7,386	7,537	36,631	7,537	36,631	7,537	7,537	6,498	3,724	7,537
42:M2-65	6,170	6,405	5,906	6,405	6,724	33,296	6,724	33,296	6,724	6,724	6,170	4,548	6,724
43:M2-66	3,935	3,890	3,958	3,890	4,150	23,773	4,150	23,773	4,150	4,150	3,935	2,949	4,150
44:M2-67	18,312	17,736	19,586	17,736	17,815	9,084	17,815	9,084	17,815	17,815	18,312	16,404	17,815
45:M2-68	5,191	5,234	5,138	5,234	5,531	27,073	5,531	27,073	5,531	5,531	5,191	3,790	5,531
46:M2-69	5,899	6,085	6,007	6,085	6,315	24,665	6,315	24,665	6,315	6,315	5,899	3,837	6,315
47:M2-70	6,265	6,657	6,325	6,657	6,855	26,687	6,855	26,687	6,855	6,855	6,265	3,781	6,855
48:M2-71	8,372	8,584	8,852	8,584	8,711	19,006	8,711	19,006	8,711	8,711	8,372	5,679	8,711
49:M2-72	7,031	7,097	7,543	7,097	7,214	16,421	7,214	16,421	7,214	7,214	7,031	4,929	7,214
50:M2-73	5,899	6,085	6,007	6,085	6,315	24,665	6,315	24,665	6,315	6,315	5,899	3,837	6,315
51:M2-74	5,899	6,085	6,007	6,085	6,315	24,665	6,315	24,665	6,315	6,315	5,899	3,837	6,315
52:M2-75	6,265	6,657	6,325	6,657	6,855	26,687	6,855	26,687	6,855	6,855	6,265	3,781	6,855
53:M2-76	5,899	6,085	6,007	6,085	6,315	24,665	6,315	24,665	6,315	6,315	5,899	3,837	6,315
54:M2-77	5,686	5,949	5,665	5,949	6,193	27,510	6,193	27,510	6,193	6,193	5,686	3,665	6,193
55:M2-78	6,660	7,102	6,349	7,102	7,388	35,442	7,388	35,442	7,388	7,388	6,660	4,616	7,388
56:M2-79	12,376	12,293	13,242	12,293	12,381	13,604	12,381	13,604	12,381	12,381	12,376	9,813	12,381
57:M2-80	5,899	6,085	6,007	6,085	6,315	24,665	6,315	24,665	6,315	6,315	5,899	3,837	6,315
58:M2-81	7,914	8,359	8,416	8,359	8,385	18,586	8,385	18,586	8,385	8,385	7,914	4,993	8,385
59:M2-82	5,899	6,085	6,007	6,085	6,315	24,665	6,315	24,665	6,315	6,315	5,899	3,837	6,315
60:D1	9,331	7,589	9,281	7,589	8,251	25,936	8,251	25,936	8,251	8,251	9,331	12,497	8,251
61:D2	6,490	5,339	6,276	5,339	5,884	28,290	5,884	28,290	5,884	5,884	6,490	8,729	5,884
62:D3	6,802	5,699	6,603	5,699	6,259	28,532	6,259	28,532	6,259	6,259	6,802	8,659	6,259
63:D4	8,007	6,443	8,673	6,443	6,837	9,170	6,837	9,170	6,837	6,837	8,007	9,986	6,837
64:D5	10,029	7,992	10,365	7,992	8,616	17,228	8,616	17,228	8,616	8,616	10,029	13,325	8,616

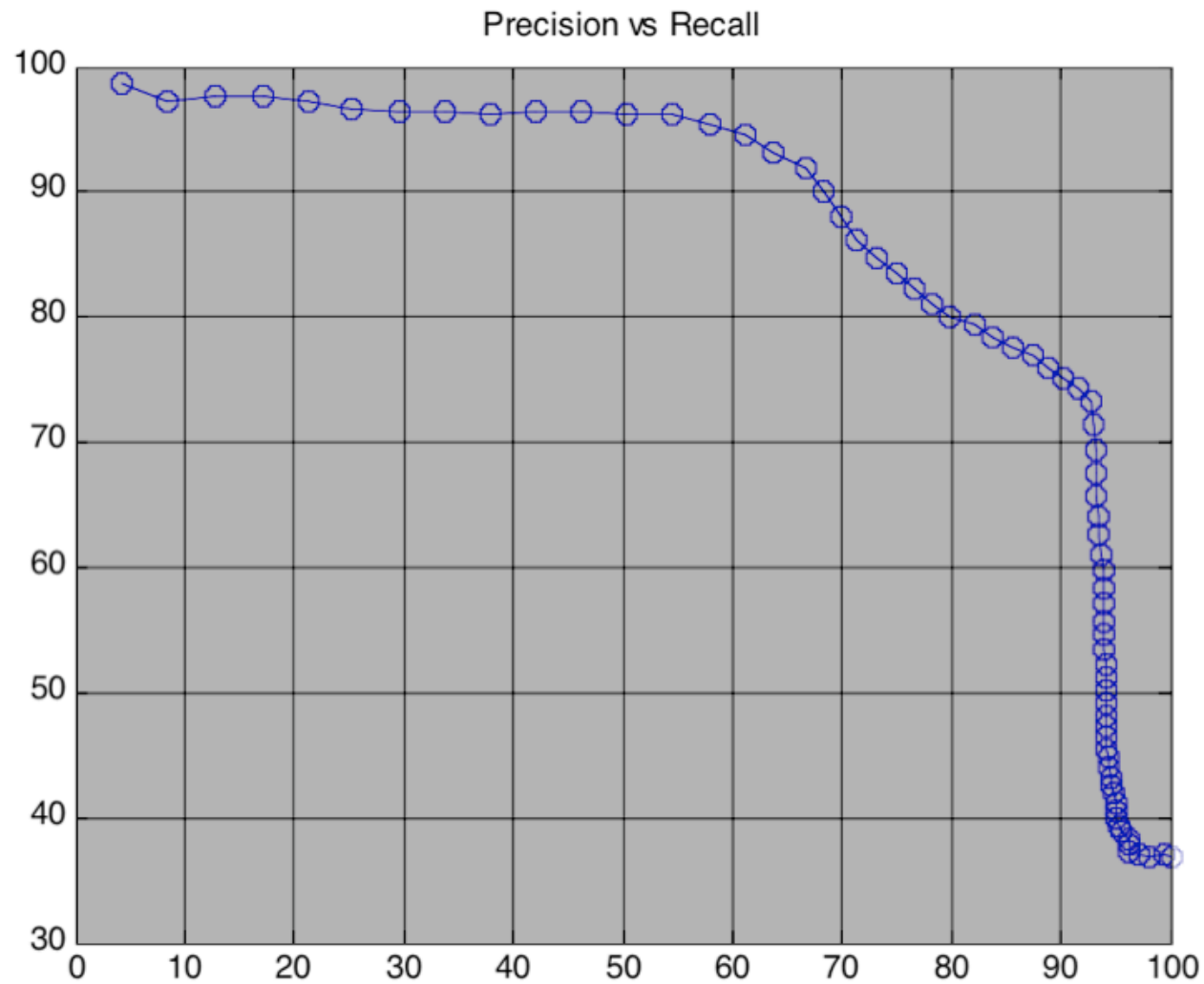
PHYLOGENETIC TREES



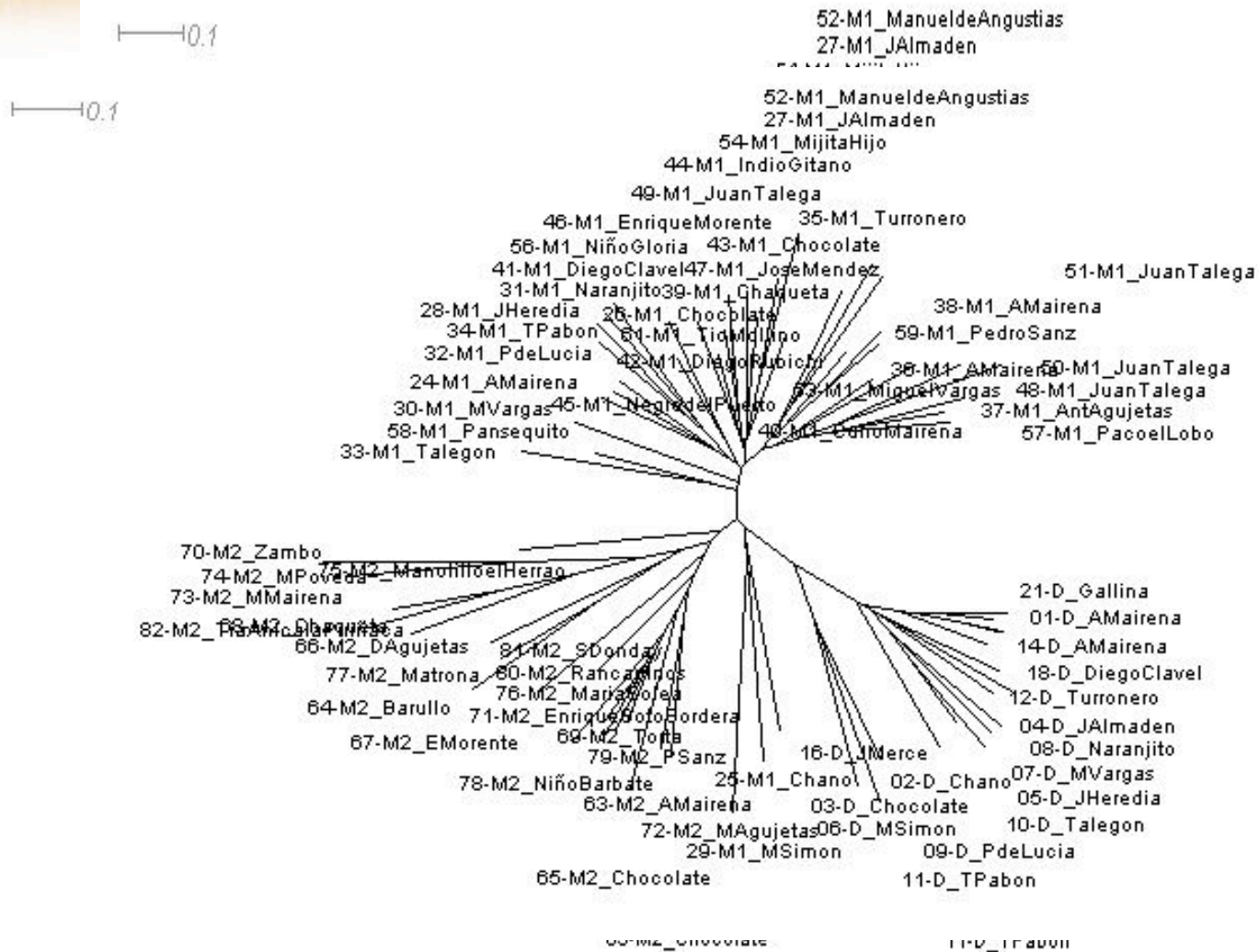
PHYLOGENETIC TREES



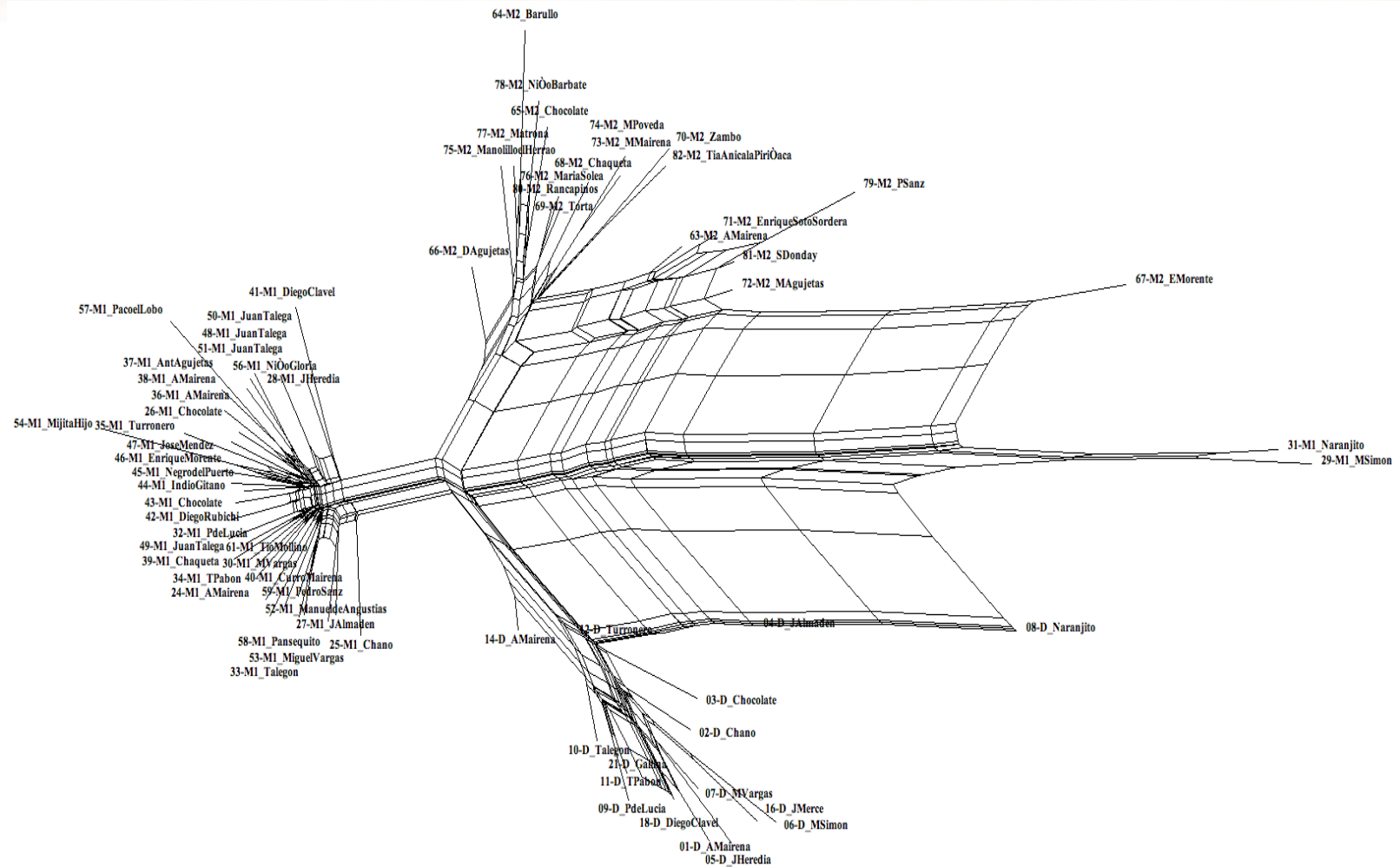
PERFORMANCE MEASURES



CONTOUR DISTANCE



DISTANCIA COMBINADA



The background is a warm-toned collage. It features a large, faint image of a violin on the left. Overlaid on this are various musical elements: a treble and bass clef with notes on staves, and several instances of binary code (0s and 1s) in different colors and orientations. The overall color palette is dominated by yellows, oranges, and reds.

Thank You!

- ♪ Midi 1
- ♪ Midi 2
- ♪ Midi 3
- ♪ Midi 4
- ♪ Midi 5
- ♪ Midi 6
- ♪ Midi 7