

# Music theory concepts for melody generation

Valerio Vardola

# Melody

- Sequence of notes and rests



# Melody

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- Sequence of notes and rests



Note = Pitch + Duration

# Pitch

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- Indicates how high/low a note is

# Pitch

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# Pitch

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# Pitch

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- Indicates how high/low a note is



# Scientific pitch notation

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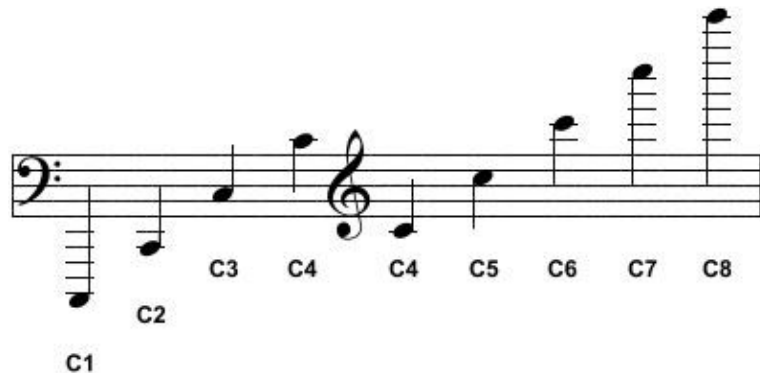
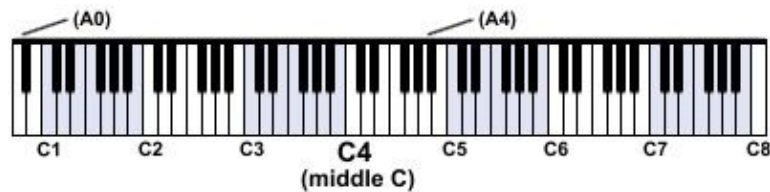
- Note name + octave
- E.g., C3, D4, A1



# Scientific pitch notation

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- Note name + octave
- E.g., C3, D4, A1



# Melody

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# Melody

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# MIDI note notation

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- MIDI is a protocol to play, edit and record music

# MIDI note notation

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- MIDI is a protocol to play, edit and record music
- Map note names to numbers
- C4 = 60


# MIDI note notation

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Note name	A7#	G7#	F7#	D7#	C7#	A6#	G6#	F6#	D6#	C6#	A5#	G5#	F5#	D5#	C5#	A4#	G4#	F4#	D4#	C4#	A3#	G3#	F3#	D3#	C3#	A2#	G2#	F2#	D2#	C2#	A1#	G1#	F1#	D1#	C1#	A0#																																																			
	108	107	106	105	104	103	102	101	100	99	98	97	96	95	94	93	92	91	90	89	88	87	86	85	84	83	82	81	80	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22
Note name	C8	B7	A7	G7	F7	E7	D7	C7	B6	A6	G6	F6	E6	D6	C6	B5	A5	G5	F5	E5	D5	C5	B4	A4	G4	F4	E4	D4	C4	B3	A3	G3	F3	E3	D3	C3	B2	A2	G2	F2	E2	D2	C2	B1	A1	G1	F1	E1	D1	C1	B0	A0																																			

# Melody

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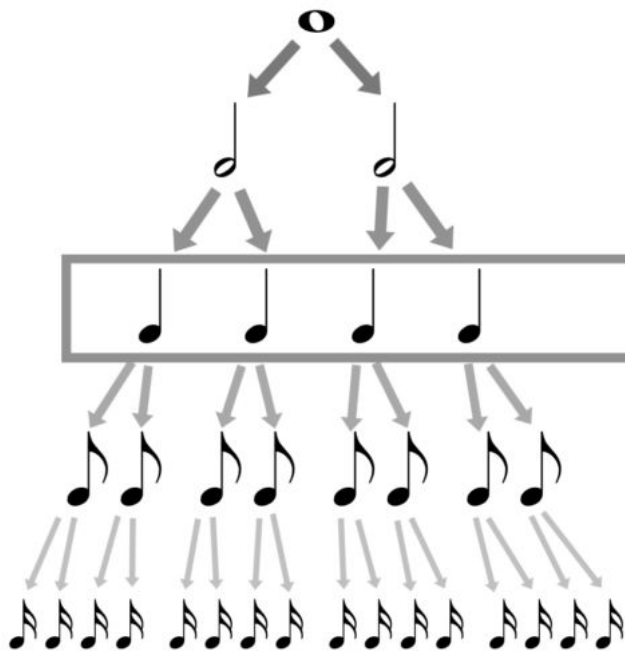


A musical score for a melody in 4/4 time, written on a single staff with a treble clef. The melody consists of 10 notes: C4 (quarter), D4 (quarter), E4 (quarter), E4 (quarter), F4 (quarter), D4 (quarter), G4 (quarter), E4 (quarter), D4 (quarter), and C4 (quarter). The notes are connected by a horizontal line, indicating a continuous melody. The final note is followed by a double bar line and a repeat sign.

Note	Frequency (Hz)
C4	60
D4	62
E4	64
E4	64
F4	65
D4	62
G4	67
E4	64
D4	62
C4	60

# Note values

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1 whole note = 4 beats

1 half note = 2 beats

1 quarter note = 1 beat

1 eighth note =  $\frac{1}{2}$  a beat

1 sixteenth note =  $\frac{1}{4}$  a beat



# Melody

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# Melody

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Duration in # beats:

4

4

# Time signature

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# beats in a bar



Type of note which equals 1 beat

The image shows a musical staff in treble clef with a 4/4 time signature. The top '4' is enclosed in a pink box and the bottom '4' is enclosed in a green box. The staff contains a sequence of notes: a quarter note, a quarter note, a half note, a quarter note, a quarter note, a half note, a quarter note, a quarter note, and a final quarter note followed by a double bar line. The notes are all quarter notes, which are indicated by the green box around the bottom '4' of the time signature.

# Time signature

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Time Signature


$\frac{3}{2}$


$\frac{3}{4}$


$\frac{3}{8}$


$\frac{3}{16}$

Beat Duration


$\frac{2}{2}$  = 

$\frac{4}{4}$  = 


$\frac{8}{8}$  = 


$\frac{16}{16}$  = 

Number of Beats

$\frac{3}{2}$  = 

$\frac{3}{4}$  = 

$\frac{3}{8}$  = 

$\frac{3}{16}$  = 

# Key

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- Group of pitches (i.e., *scale*) that forms the centre of a piece
- Tonic + mode
- E.g., C maj, D min

# Tonic note

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- Pitch that provides sense of arrival
- Centre of gravity
- Often found at the beginning/end of a piece

# Tonic note

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# Tonic note

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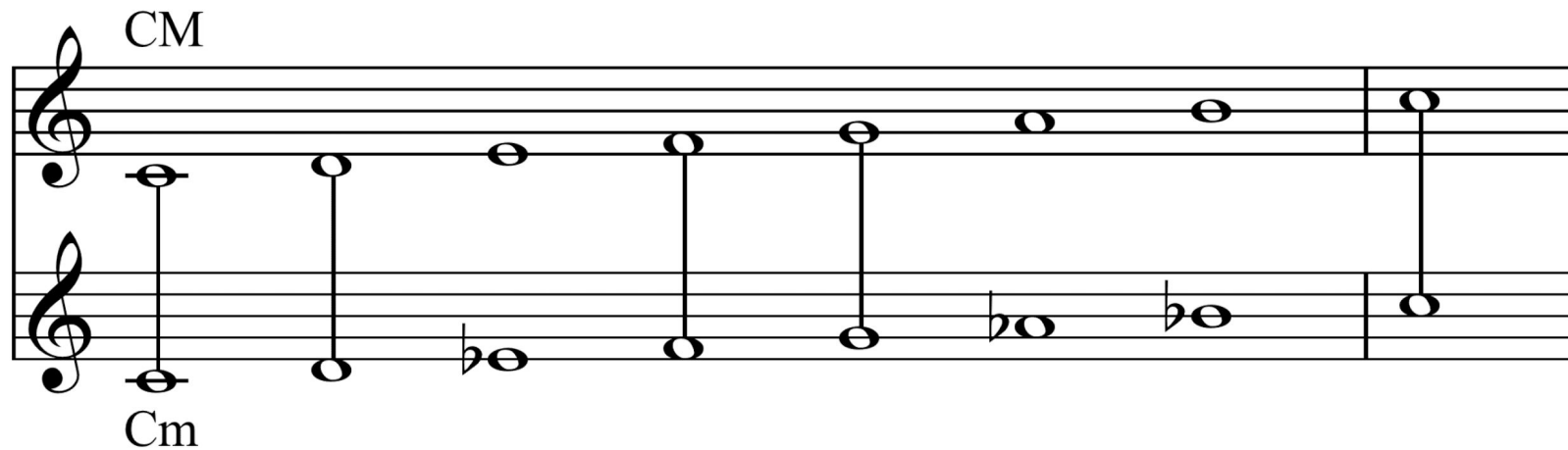
- Pitch that provides sense of arrival
- Centre of gravity
- Often found at the beginning/end of a piece





# Major/minor scale

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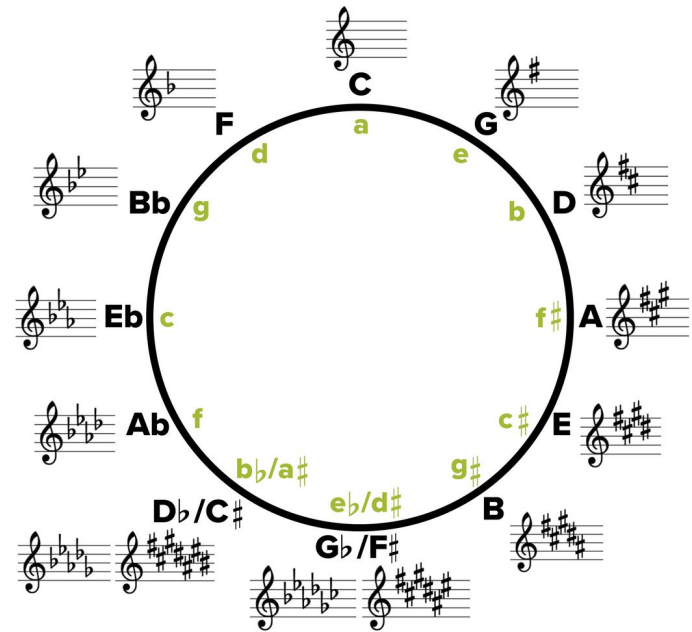
# keys

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12 notes x 2 modes = 24 keys

# # keys

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# Transposition

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- Moving collection notes up/down by a given interval
- Change key
- Musical content remains the same

# Music representation

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# Music representation: Idea 1

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- Sequence
- Pitch/duration info for each note
- E.g., [(C4, 1), (D4, 1), ...]

# Music representation: Idea 1

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- Sequence
- Pitch/duration info for each note
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# Music representation: Idea 2

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- Time series
- Sample melody at each 16th note
- Each step = 16th note
- Log MIDI note when note occurs
- Use “\_” symbol for held notes
- Use “r” symbol for rest



# Time series representation: Example

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- 4/4 time signature
- 16 samples per bar
- 4 samples per quarter note



# Time series representation: Example

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[ "60", "\_", "\_", "\_",



# Time series representation: Example

---

[ "60", "\_", "\_", "\_",

"62", "\_", "\_", "\_",



# Time series representation: Example

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[ "60", "\_", "\_", "\_",  
"62", "\_", "\_", "\_",  
"64", "\_", "64", "\_",



# Time series representation: Example

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[ "60", "\_", "\_", "\_",  
"62", "\_", "\_", "\_",  
"64", "\_", "64", "\_",  
"65", "\_", "62", "\_",  
...]



# Preparing melodies for LSTM ingestion

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Time series representation



Map time series representation to integers



One-hot encoding

# What next?

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- Preprocess folk song dataset