Pneumonia

rule

$$\begin{split} & [G](\text{max}(\text{mfcc2}) > 1.60) \ \, \Lambda \ \, [G](\text{max}(\text{mfcc3}) > -0.52) \ \, \Lambda \ \, [G](\text{max}(\text{mel12=2383Hz}) > 1.23e-8) \ \, \Lambda \ \, [G](\text{std}^+(\text{mfcc6}) < 0.32) \\ & \langle G \rangle(\text{max}(\text{mel8=1194Hz}) \leq -4.91) \ \, \Lambda \ \, [G](\text{max}(\text{cntrd}) < 1084.33) \ \, \Lambda \ \, [G](\text{std}^+(\text{mel10=1687Hz}) < 0.42) \ \, \Lambda \ \, [G]((\text{max}(\text{mel8=1194Hz}) < 0.42) \ \, \Lambda \ \, [G]((\text{max}(\text{mel8=1194Hz}) < 0.42) \ \, \Lambda \ \, (\text{std}(\text{mel8=1194Hz}) < 0.19) \\ & \langle G \rangle((\text{max}(\text{mfcc2}) \leq 1.60) \ \, \Lambda \ \, \langle \overline{DBE} \rangle(\text{min}(\text{mfcc5}) \geq -0.01)) \ \, \Lambda \ \, [G]((\text{max}(\text{mfcc2}) \leq 1.60) \ \, \rightarrow \ \, [G](\text{max}(\text{mfcc5}) < 0.91)) \\ & \langle G \rangle((\text{max}(\text{cntrd}) \geq 1.50) \ \, \Lambda \ \, (\text{max}(\text{mfcc4}) \geq 0.56) \ \, \Lambda \ \, (\text{mean}(\text{mfcc5}) < 0.48) \ \, \Lambda \ \, (\text{med}(\text{mel11=2005Hz}) < 9.76e-5) \\ & \langle G \rangle((\text{max}(\text{cntrd}) \geq 1084.33) \ \, \Lambda \ \, (\text{std}^-(\text{skwns}) \leq 0.08)) \end{split}$$

Bronchiecstasis

rule

⟨G⟩(max(kurts) ≤ 5.06) Λ [G]((max(kurts) ≤ 5.06) \rightarrow [D̄BĒ](median(mel8=1194Hz) > 9.17e-5)) ⟨G⟩(max(mel7=1005Hz) ≥ -4.14) Λ [G]((max(mel7=1005Hz) ≥ -4.14) \rightarrow [AO](max(kurts) > 6.44)) std(decrs) < 2.77

 $\langle G \rangle ((\text{max}(\text{kurts}) \leq 5.06) \ \land \ \langle \overline{\text{DBE}} \rangle (\text{median}(\text{mel8}=1194\text{Hz}) \leq 9.17\text{e-5})) \ \land \ [G]((\text{max}(\text{kurts}) \leq 5.06) \ \rightarrow \ [\overline{\text{DBE}}]((\text{median}(\text{mel8}=1194\text{Hz}) \leq 9.17\text{e-5}))) \ \land \ [G]((\text{max}(\text{kurts}) \leq 5.06) \ \rightarrow \ [\overline{\text{DBE}}]((\text{median}(\text{mel8}=1194\text{Hz}) \leq 9.17\text{e-5}))) \ \land \ \langle \overline{\text{DBE}} \rangle ((\text{mean}(\text{mel7}=1005\text{Hz}) \leq -4.18))) \ \land \ \langle \overline{\text{DBE}} \rangle ((\text{median}(\text{mel8}=1194\text{Hz}) \leq -4.18))) \ \land \ \langle \overline{\text{DBE}} \rangle ((\text{median}(\text{mel8}=1194\text{Hz}) \leq -4.18))) \ \land \ \langle \overline{\text{DBE}} \rangle ((\text{median}(\text{mel8}=1194\text{Hz}) \leq -4.18))) \ \land \ \langle \overline{\text{DBE}} \rangle ((\text{median}(\text{mel8}=1194\text{Hz}) \leq -4.18))) \ \land \ \langle \overline{\text{DBE}} \rangle ((\text{median}(\text{mel8}=1194\text{Hz}) \leq -4.18))) \ \land \ \langle \overline{\text{DBE}} \rangle ((\text{median}(\text{mel8}=1194\text{Hz}) \leq -4.18))) \ \land \ \langle \overline{\text{DBE}} \rangle ((\text{median}(\text{mel8}=1194\text{Hz}) \leq -4.18))) \ \land \ \langle \overline{\text{DBE}} \rangle ((\text{median}(\text{mel8}=1194\text{Hz}) \leq -4.18))) \ \land \ \langle \overline{\text{DBE}} \rangle ((\text{median}(\text{mel8}=1194\text{Hz}) \leq -4.18))) \ \land \ \langle \overline{\text{DBE}} \rangle ((\text{median}(\text{mel8}=1194\text{Hz}) \leq -4.18))) \ \land \ \langle \overline{\text{DBE}} \rangle ((\text{median}(\text{mel8}=1194\text{Hz}) \leq -4.18))) \ \land \ \langle \overline{\text{DBE}} \rangle ((\text{median}(\text{mel8}=1194\text{Hz}) \leq -4.18))) \ \land \ \langle \overline{\text{DBE}} \rangle ((\text{median}(\text{mel8}=1194\text{Hz}) \leq -4.18))) \ \land \ \langle \overline{\text{DBE}} \rangle ((\text{median}(\text{mel8}=1194\text{Hz}) \leq -4.18))) \ \land \ \langle \overline{\text{DBE}} \rangle ((\text{median}(\text{mel8}=1194\text{Hz}) \leq -4.18))) \ \land \ \langle \overline{\text{DBE}} \rangle ((\text{median}(\text{mel8}=1194\text{Hz}) \leq -4.18))) \ \land \ \langle \overline{\text{DBE}} \rangle ((\text{median}(\text{mel8}=1194\text{Hz}) \leq -4.18))) \ \land \ \langle \overline{\text{DBE}} \rangle ((\text{median}(\text{mel8}=1194\text{Hz}) \leq -4.18))) \ \land \ \langle \overline{\text{DBE}} \rangle ((\text{median}(\text{mel8}=1194\text{Hz}) \leq -4.18))) \ \land \ \langle \overline{\text{DBE}} \rangle ((\text{median}(\text{mel8}=1194\text{Hz}) \leq -4.18)) \ \land \ \langle \overline{\text{DBE}} \rangle ((\text{median}(\text{mel8}=1194\text{Hz}) \leq -4.18)) \ \land \ \langle \overline{\text{DBE}} \rangle ((\text{median}(\text{mel8}=1194\text{Hz}) \leq -4.18)) \ \land \ \langle \overline{\text{DBE}} \rangle ((\text{median}(\text{mel8}=1194\text{Hz}) \leq -4.18)) \ \land \ \langle \overline{\text{DBE}} \rangle ((\text{median}(\text{mel8}=1194\text{Hz}) \leq -4.18)) \ \land \ \langle \overline{\text{DBE}} \rangle ((\text{median}(\text{mel8}=1194\text{Hz}) \leq -4.18)) \ \land \ \langle \overline{\text{DBE}} \rangle ((\text{median}(\text{mel8}=1194\text{Hz}) \leq -4.18)) \ \land \ \langle \overline{\text{DBE}} \rangle ((\text{median}(\text{mel8}=1194\text{Hz}) \leq -4.18)) \ \land \ \langle \overline{\text{DBE}} \rangle$

COPD

rule

 $\begin{array}{l} \mbox{$\langle G \rangle$ ((max(mfcc6) \geq 0.05) \ \Lambda \ (max(mfcc5) \leq 0.24)) \ \Lambda \ [G](max(mel5=711Hz) > 5.15e-5)$ \\ \mbox{$(med(entrp) \geq 0.23) \ \Lambda \ (min(mel14=3366Hz) \geq -5.87)$} \\ \mbox{$\langle G \rangle$ ((max(mel1=357Hz) \leq -3.83) \ \Lambda \ (\overline{L})$ ((max(mel13=2832Hz) \geq -8.07) \ \Lambda \ (max(skwns) \leq 1.57) \ \Lambda \ (G)$ (std+(entrp) \geq 0.11)))$ \\ \mbox{$(mean(crest) \geq 120.66) \ \Lambda \ (min(mfcc2) < 1.55) \ \Lambda \ (med(mel13=2832Hz) < 8.06e-5) \ \Lambda \ (mean(slope) \geq -0.05)$} \\ \end{array}$

URTI

rule

(G)((max(mel7=1005Hz) ≤ -4.79) Λ (AO)(sumdiagcov⁻(entrp) ≤ 0.04)) Λ [G]((max(flatn) < 0.14) Λ [G]((max(mel7=1005Hz) (mean(mfcc2) ≥ 3.53) Λ (mean(mel3=504Hz) ≥ 9.25e-5) Λ (max(mel13=2832Hz) < 1.44e-6)

 $\begin{tabular}{ll} $\langle G \rangle(max(flatn) \geq 0.14) \ \land \ [G]((max(flatn) \geq 0.14) \ \rightarrow \ [L](max(flatn) < 0.28)) \ \land \ [G]((max(flatn) \geq 0.14) \ \rightarrow \ [L](sumdiagcov^-(flatn) < 0.28)) \ \land \ (max(flatn) \geq 0.14) \ \rightarrow \ [L](sumdiagcov^-(flatn) < 0.28)) \ \land \ (max(flatn) \geq 0.14) \ \rightarrow \ [L](sumdiagcov^-(flatn) < 0.28)) \ \land \ (max(flatn) \geq 0.14) \ \rightarrow \ [L](sumdiagcov^-(flatn) < 0.28)) \ \land \ (max(flatn) \geq 0.14) \ \rightarrow \ [L](sumdiagcov^-(flatn) < 0.28)) \ \land \ (max(flatn) \geq 0.14) \ \rightarrow \ [L](sumdiagcov^-(flatn) < 0.28)) \ \land \ (max(flatn) \geq 0.14) \ \rightarrow \ [L](sumdiagcov^-(flatn) < 0.28)) \ \land \ (max(flatn) \geq 0.14) \ \rightarrow \ [L](sumdiagcov^-(flatn) < 0.28)) \ \land \ (max(flatn) \geq 0.14) \ \rightarrow \ [L](sumdiagcov^-(flatn) < 0.28)) \ \land \ (max(flatn) \geq 0.14) \ \rightarrow \ [L](sumdiagcov^-(flatn) < 0.28)) \ \land \ (max(flatn) \geq 0.14) \ \rightarrow \ [L](sumdiagcov^-(flatn) < 0.28)) \ \land \ (max(flatn) \geq 0.14) \ \rightarrow \ [L](sumdiagcov^-(flatn) < 0.28)) \ \land \ (max(flatn) \geq 0.14) \ \rightarrow \ [L](sumdiagcov^-(flatn) < 0.28)) \ \land \ (max(flatn) \geq 0.14) \ \rightarrow \ [L](sumdiagcov^-(flatn) < 0.28)) \ \land \ (max(flatn) \geq 0.28$

Bronchiolitis

rule

⟨G⟩((max(crest) ≥ 39.35) \land ⟨AO⟩((mean(mel1=357Hz) ≥ 0.00) \land (mean(mfcc1) ≤ -19.99))) \land [G]((max(crest) ≥ 39.35) \rightarrow [A (mean(kurts) < 5761.28) \land (med(mel6=845Hz) < -3.25) \land (mean(entrp) ≥ 0.21) \land (min(skwns) < 3.35) [G](max(crest) < 39.35) \land [G](std⁻(mel11=2005Hz) > 1.23e-9) mean(kurts) ≥ 5761.28

interesting_rules_Pneumonia

consequent	coverage	confidence		natoms type	condition	scale
Pneumonia	0.25	0.96			Pneumonia	semitones
Pneumonia	0.28				Pneumonia	semitones
Pneumonia	0.17	_		11	Pneumonia	semitones
Healthy	0.4	0.0_			Pneumonia	semitones
Healthy	0.37			.	Pneumonia	semitones
Healthy	0.17	1	2.02	2 modal	Pneumonia	semitones
consequent	coverage	confidence		natoms type	condition	scale
Bronchiectasis	0.14				Bronchiectasis	semitones
Bronchiectasis	0.28				Bronchiectasis	semitones
Bronchiectasis	0.5		_	l l	Bronchiectasis	semitones
Healthy	0.44	0.0.			Bronchiectasis	semitones
Healthy	0.17		_		Bronchiectasis	semitones
Healthy	0.61	_			Bronchiectasis	semitones
Healthy	0.5	1	2	1 propositional	Bronchiectasis	semitones
consequent	coverage		lift	natoms type	condition	scale
COPD	0.25	0.96	2.04	3 modal	COPD	semitones
COPD COPD	0.25 0.27	0.96 0.97	2.04 2.01	3 modal 2 propositional	COPD COPD	semitones semitones
COPD COPD Healthy	0.25 0.27 0.32	0.96 0.97 0.94	2.04 2.01 1.92	3 modal 2 propositional 4 modal	COPD COPD COPD	semitones semitones semitones
COPD COPD	0.25 0.27	0.96 0.97 0.94	2.04 2.01 1.92	3 modal 2 propositional 4 modal	COPD COPD	semitones semitones
COPD COPD Healthy	0.25 0.27 0.32 0.32	0.96 0.97 0.94 0.97	2.04 2.01 1.92 2.27	3 modal 2 propositional 4 modal 4 propositional	COPD COPD COPD	semitones semitones semitones
COPD COPD Healthy Healthy consequent	0.25 0.27 0.32 0.32 coverage	0.96 0.97 0.94 0.97 confidence	2.04 2.01 1.92 2.27	3 modal 2 propositional 4 modal 4 propositional natoms type	COPD COPD COPD COPD	semitones semitones semitones semitones
COPD COPD Healthy Healthy consequent URTI	0.25 0.27 0.32 0.32 coverage 0.24	0.96 0.97 0.94 0.97 confidence	2.04 2.01 1.92 2.27 lift 1.69	3 modal 2 propositional 4 modal 4 propositional natoms type 7 modal	COPD COPD COPD COPD Condition URTI	semitones semitones semitones semitones
COPD COPD Healthy Healthy URTI URTI	0.25 0.27 0.32 0.32 coverage 0.24 0.16	0.96 0.97 0.94 0.97 confidence 0.9	2.04 2.01 1.92 2.27 lift 1.69 1.8	3 modal 2 propositional 4 modal 4 propositional natoms type 7 modal 3 propositional	COPD COPD COPD COPD condition URTI URTI	semitones semitones semitones semitones scale semitones semitones
COPD COPD Healthy Healthy consequent URTI URTI Healthy	0.25 0.27 0.32 0.32 coverage 0.24 0.16 0.14	0.96 0.97 0.94 0.97 confidence 0.9 0.86 0.5	2.04 2.01 1.92 2.27 lift 1.69 1.8 1.08	3 modal 2 propositional 4 modal 4 propositional natoms type 7 modal 3 propositional 7 modal	COPD COPD COPD COPD COND CONDITION URTI URTI URTI	semitones semitones semitones semitones semitones semitones semitones
COPD COPD Healthy Healthy URTI URTI	0.25 0.27 0.32 0.32 coverage 0.24 0.16	0.96 0.97 0.94 0.97 confidence 0.9 0.86 0.5	2.04 2.01 1.92 2.27 lift 1.69 1.8 1.08	3 modal 2 propositional 4 modal 4 propositional natoms type 7 modal 3 propositional 7 modal	COPD COPD COPD COPD condition URTI URTI	semitones semitones semitones semitones scale semitones semitones
COPD COPD Healthy Healthy consequent URTI URTI Healthy	0.25 0.27 0.32 0.32 coverage 0.24 0.16 0.14	0.96 0.97 0.94 0.97 confidence 0.9 0.86 0.5	2.04 2.01 1.92 2.27 lift 1.69 1.8 1.08 1.31	3 modal 2 propositional 4 modal 4 propositional natoms type 7 modal 3 propositional 7 modal	COPD COPD COPD COPD condition URTI URTI URTI URTI	semitones semitones semitones semitones semitones semitones semitones semitones
COPD COPD Healthy Healthy consequent URTI URTI Healthy	0.25 0.27 0.32 0.32 coverage 0.24 0.16 0.14	0.96 0.97 0.94 0.97 confidence 0.9 0.86 0.5	2.04 2.01 1.92 2.27 lift 1.69 1.8 1.08 1.31	3 modal 2 propositional 4 modal 4 propositional natoms type 7 modal 3 propositional 7 modal 8 propositional	COPD COPD COPD COPD condition URTI URTI URTI URTI URTI	semitones semitones semitones semitones semitones semitones semitones
COPD COPD Healthy Healthy consequent URTI URTI Healthy Healthy consequent Bronchiolitis	0.25 0.27 0.32 0.32 coverage 0.24 0.16 0.14 0.12 coverage 0.25	0.96 0.97 0.94 0.97 confidence 0.9 0.86 0.5 0.7 confidence	2.04 2.01 1.92 2.27 lift 1.69 1.8 1.08 1.31	3 modal 2 propositional 4 modal 4 propositional natoms type 7 modal 3 propositional 7 modal 8 propositional natoms type 7 modal	COPD COPD COPD COPD condition URTI URTI URTI URTI URTI URTI URTI URTI	semitones
COPD COPD Healthy Healthy consequent URTI URTI Healthy Healthy consequent Bronchiolitis Bronchiolitis	0.25 0.27 0.32 0.32 coverage 0.24 0.16 0.14 0.12 coverage 0.25 0.25	0.96 0.97 0.94 0.97 confidence 0.9 0.86 0.5 0.7 confidence 0.93 0.93	2.04 2.01 1.92 2.27 lift 1.69 1.8 1.08 1.31 lift 1.63 1.93	3 modal 2 propositional 4 modal 4 propositional natoms type 7 modal 3 propositional 7 modal 8 propositional natoms type 7 modal 4 propositional	COPD COPD COPD COPD COPD condition URTI URTI URTI URTI URTI URTI URTI URTI	semitones
COPD COPD Healthy Healthy consequent URTI URTI Healthy Healthy consequent Bronchiolitis Bronchiolitis Healthy	0.25 0.27 0.32 0.32 coverage 0.24 0.16 0.14 0.12 coverage 0.25 0.25 0.21	0.96 0.97 0.94 0.97 confidence 0.9 0.86 0.5 0.7 confidence 0.93 0.93	2.04 2.01 1.92 2.27 lift 1.69 1.8 1.08 1.31 lift 1.63 1.93 1.94	3 modal 2 propositional 4 modal 4 propositional natoms type 7 modal 3 propositional 7 modal 8 propositional natoms type 7 modal 4 propositional 2 modal	COPD COPD COPD COPD COPD condition URTI URTI URTI URTI URTI URTI URTI URTI	semitones
COPD COPD Healthy Healthy consequent URTI URTI Healthy Healthy Healthy Bronchiolitis Bronchiolitis	0.25 0.27 0.32 0.32 coverage 0.24 0.16 0.14 0.12 coverage 0.25 0.25	0.96 0.97 0.94 0.97 confidence 0.9 0.86 0.5 0.7 confidence 0.93 0.93	2.04 2.01 1.92 2.27 lift 1.69 1.8 1.31 lift 1.63 1.93 1.94	3 modal 2 propositional 4 modal 4 propositional natoms type 7 modal 3 propositional 7 modal 8 propositional natoms type 7 modal 4 propositional	COPD COPD COPD COPD COPD condition URTI URTI URTI URTI URTI URTI URTI URTI	semitones

interesting_rules_Pneumonia

featset (:mfcc,) 0 (:mfcc,) (:mfcc,) () featset (:mfcc,) () () (:mfcc,) () (:mfcc,) () featset (:mfcc,) 0 (:mfcc,) featset () (:mfcc,) 0 featset (:mfcc,) () (:mfcc,)

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